CHAPTER LXVIII: VOCATIONAL SCHOOLS FOR GIRLS.

SECTION 1: INTRODUCTORY.*

Trade schools for girls, or even schools that offer industrial courses which aim directly to fit girls for specific occupations, are not numerous. However, the interest in those which have been established is manifested both by a definite movement for the organization of other schools and by their influence on the economic and social problems of wage-earning women. Before organizing industrial schools for girls in any community the need of studying not only the schools but also the local industrial conditions under which women work is recognized as essential. Investigations of the opportunities for women in various vocations have been limited in scope and few in number. Where such have been made, the information secured has been exceedingly valuable to the schools; but what is true in one locality may not apply to others. In many cases a general conviction that girls should have, or were demanding, some vocational training has led to the introduction of dressmaking and millinery, with little knowledge of the local conditions of work, wages, hours, chances of employment and opportunities in the industry. This has frequently been done by committees of men unacquainted with the millinery and dressmaking trades, and who did not know whether there were other vocations that offered better opportunities for girls. The advisory committees and directors of some of the schools likewise have frequently been men and women of little knowledge of women's occupations and opportunities.

Dressmaking and Millinery Defined.

It is noticeable that dressmaking and millinery are almost the only trade courses offered to girls at present. Power sewing-machine operating is only another form of work on clothing. The dressmaking trade itself is so specialized that it is difficult to enumerate the subdivisions in the trade so that they may apply to all schools. The plain sewing courses are usually planned to train seamstresses—i. e. girls who are able to do plain sewing and mending in homes. A dressmaker's assistant, or improver, as the term is used in the trade, means a skilled worker who knows the sewing processes and can intelligently take directions from experienced sleeve, waist, and skirt makers. A dressmaker proper must have a fundamental knowledge of all branches of the trade. The occupations of designing, drafting, fitting, etc., are the higher positions and are usually secured by working up from the lower positions.

The terms used for the subdivisions in the millinery trade are fully as indefinite as those of the dressmaking trade. Because of this lack of definiteness the

* Condensed from 25th Annual Report of the United States Commissioner of Labor, 1910.

term "assistant" is used here, as in the dressmaking trade, to mean the position of the worker skilled in the processes, but who works under the direction of experienced workers. As in dressmaking, experience as well as knowledge of processes is necessary to be a finished milliner. The occupation of designing, copying and trimming are the higher positions in this trade. An effort is now being made by the schools to define the terms designating workers in these trades so as to eliminate the present prevalent confusion when pupils seek employment.

Two of the schools, the Manhattan Trade School for Girls and the Girls' Trade School of Boston, have worked out a distinct department of the school as an employment bureau for their graduates. Thus they are enabled to keep in touch with conditions in the industries for which they are preparing girls.

Various Types of Schools.

In schools of the elementary short-time type, the usual purpose is to prepare girls of the poorer classes to become self-supporting as quickly as possible. The class of pupils for which these schools were established is especially characteristic of large cities, and this must be borne in mind in considering them. A large percentage of their pupils have not gone beyond the fifth year in the grammar school. The chief emphasis of the entire course is the practical character of the training. It is not expected that pupils will be finished dressmakers or milliners, but only that they will be qualified for work as assistants. As a rule, pupils must be of legal working age in order to enter these schools. In the short period of school training an attempt is made to put the girls in proper physical condition for work, with enough instruction in the laws of health to enable them to remain so.

The advanced short-time schools are somewhat different in their general characteristic from the other types. Their pupils pay a tuition fee, and they are usually older and better able to profit by the instruction given. The school work is offered in courses, so that a pupil may take as much or as little as is desired, but these courses are fitted to the actual needs of the pupils for whom they are designed. The work is of high grade, and is arranged to meet the needs of the trade. No academic subjects are taught, as it is expected that all such instruction will have been secured before entering the school. As the work in this type of schools is advanced in character, considerable attention is paid to designing and costume sketching.

Day and Evening Schools.

A third group of girls' schools offers longer and more theoretical instruction, but of a less pronounced trade character than that of either of the above types. Among these are public high schools with day courses for industrial training. Their entrance requirements often include graduation from the grammar school, and their courses are usually 3 or 4 years in length. The first year's work in these schools is largely cultural, while that of the remaining years is planned to be as closely related to their chosen vocations as possible. Training is given in all features of the pupil's work during her stay in the school.

In a fourth group of schools there may be included the evening schools for women. Some of these are public schools, and some are philanthropic. Their courses are offered for girls and women employed during the day. Much of the work in them appeals particularly to girls who want it for home use. Many enter such courses because of a definite prospect of marriage, and are taking it in preparation for housekeeping. The instruction given in these schools is not limited to the processes employed in the different occupations taught, but includes cultural subjects, physical training, and regulations and laws which will affect pupils when they go to work. The aim is to make intelligent as well as skilful working women.

SECTION 2: THE MANHATTAN TRADE SCHOOL FOR GIRLS, NEW YORK.

This school, which was visited under the guidance of the Principal, Miss Florence J. Marshall, enables girls, on leaving school, to become skilled workwomen in a shorter time and in a larger and more intelligent way than through trade training alone. Pupils must have graduated from the elementary school and be of good moral character. The course covers one or two years, but girls may remain longer. The school day is from 9 a.m. to 5 p.m. with 1 hour for lunch, thus accustoming girls gradually to the working day. Pupils who know what trade they mean to follow can start on it at once, while those in doubt are given an opportunity of choosing and deciding. All instruction is individual.

There are 45 workwomen employed as salaried instructors, receiving from $2.50 to $3 a day, and taking about 10 pupils each. The teachers are experts in their respective lines, the trades being taught by experienced mechanics, and everything is done to make the school prepare for actual business practice, by keeping to factory methods as closely as possible. On completing the course pupils receive a diploma which helps them to obtain employment.

The academic work has a bearing on the trade, and includes Civics, Business English, Mathematics of the trade, Industrial Conditions, Instruction on Labor Unions, etc., Hygiene and Physical Culture. A course is also given to illustrate the privileges, rights and duties of each unit, the ethics of trade, cost of living, etc.

Pupils are admitted at any time. There are now 400 in attendance. Girls are not expected to leave in less than a year, but many do. The school takes a neutral attitude towards employers and workers, but holds that girls should have an intelligent understanding of trade unions and collective bargaining. Regular trade orders are taken from outside.

Girls are examined on entrance by a physician and the physical instructor. Lectures on personal hygiene and related subjects are given, and physical training twice a week. The expense of the physical department is partly met by philanthropic ladies.

The girls start at $4 a week, but are told that they must make at least $8 to cover expenses. The type of students in attendance is high, the girls being

bright, keen, neat and industrious. Many of them are of foreign birth or parentage. Places are found for them, and the school keeps in touch with them after they leave.

Aims, Characteristics, Results.

The *Aims* of the School are:—
(1) To train girls in skilled handwork.
(2) To produce the best type of trade worker.
(3) To imbue each worker with love of and respect for work.
(4) To uplift a class to which the country must look for future industrial progress.
The *Characteristics* of this School are:—
(1) It fits girls for the actual needs of the trade.
(2) Trade instruction occupies the great part of each day.
(3 Practical academic work, drawing and color work, are taught with a single eye to their bearing on trade needs.
(4) The work is based on the three fundamental tools—the needle, sewing machine (foot and power), the paste brush, out of which countless branches of trade work grow.
The *Results* are:—awakened intelligence, increasing skill, accuracy and speed, capacity for clear and original thinking, love for work. Girls are placed within a year at good wages. The school is appreciated by the trade.

The Reason for the School.*

In 1902 a committee of men and women interested in philanthropic, sociological, economic and educational work in New York made a special investigation of the workrooms in that city. They were but the more convinced (1) that wages of unskilled labor are declining; (2) while there is a good opportunity for highly skilled labor, the supply is inadequate; (3) the condition of the young, inexpert working girl must be ameliorated by the speedy opening of a trade school for those who have reached the age to obtain working papers; (4) if public instruction could not immediately undertake the organization of such a school, then private initiative must do so, even though it must depend for its support upon voluntary contributions. The result was that an extreme effort was put forth and the following November the first trade school in America for girls of 14 was begun.

A Short-time Trade School.

The immediate purpose of the school was to train the youngest and poorest wage-earners to be self-supporting as quickly as possible. It was decided to help the industrial workers rather than the commercial and professional, as the last two are already to some extent provided for in education. The function of the school was, therefore, that of the Short-Time Trade School, which would provide the girl who must go to work the moment she can obtain her working papers (about 14) with an enlightened apprenticeship in some productive occupation. Such training cannot be obtained satisfactorily in the market. The immature workers are present there in such large numbers that they complicate the industrial problem by their poverty and inability, and thus tend to lower the wage. Jane Addams of Hull House, Chicago, says these untrained girls "enter industry at its most painful point, where the trades are already so overcrowded and subdivided that there remains in them very little education for the worker." The school purposed to give its help at this very point.

What the Trades Demand.

Trade, on its side, is eager to have skilled women directly fitted for its workrooms, but finds them hard to obtain. The school's duty was to discover the way to meet employers of labour. It is true that the utilitarian and industrial education, offered by public and private instruction, has benefited the home and society, but such training has not met the problem of adequately fitting for specific employments the young worker who has but a few months to spare. The lack of this instruction has been in specific trade application and flexibility as to method, artistic needs, and mechanical devices. These points are essential to place the girl in immediate touch with her workroom.

The School's Ideals.

Therefore the Manhattan Trade School assumed the responsibility of providing an economic instruction in the practical work of various trades, thus supplying them with capable assistants. Hence its purpose differed not only from the more general instruction of the usual technical

*From sketch of the School and its work, by Mary Schenck Woolman, B.S., Prof. of Domestic Art, Teachers' College, Columbia University, and Director of the Manhattan Trade School for Girls.

institution, but also from those schools which offered specific training in one trade (such as dressmaking), in that it (1) offered help to the youngest wage-earners, (2) gave the choice among many trades, and (3) held the firm conviction that the adequate preparation of successful workers requires more factors of instruction than the training for skill alone. The ideals of the school were the following: (1) to train a girl that she may become self supporting; (2) to furnish a training which shall enable the worker to shift from one occupation to another allied occupation, *i.e.*, elasticity; (3) to train a girl to understand her relation to her employer, to her fellow worker, and to her product; (4) to train a girl to value health and to know how to keep and improve it; (5) to train a girl to utilize her former education in such necessary business processes as belong to her workroom; (6) to develop a better woman while making a successful worker; (7) to teach the community at large how best to accomplish such training, *i.e.*, to serve as a model whose advice and help would facilitate the founding of the best kind of schools for the lowest rank of women workers.

A Complex Problem.

In other words, the Manhattan Trade School aimed to find a way (1) to improve the worker, physically, mentally, morally and financially; (2) to better the conditions of labor in the workroom; (3) to raise the character of the industries and the conditions of the homes, and (4) to show that such education could be practically undertaken by public instruction. The four aims are really one, for the better workers should improve the product, make higher wages, react advantageously on the industrial situation and on the home, and the course of instruction formulated to accomplish this end would help in the further introduction of such training. In general, it may be said that the untrained girl has to take the best place she can find, without reference to her ability, her physical condition, or her inclination. The most desirable trades are seldom open to her, for they require workers of experience, or, at least, those who have had recognized instruction. Even if a green girl enters a skilled trade, she cannot rise easily in it, and is apt to be dropped out at the first slack season. The sort of positions open to her have usually little future, as they are isolated occupations that do not lead to advanced work. Illustrations of these employments are wrapping braid, sorting silk, running errands, tying fringe, taking out and putting in buttons in a laundry, dipping candy, assorting lamps, making cigarettes, tending a machine, and tying up packages. These young unskilled girls wander from one of these occupations to another, their salaries, never running high, rise and fall according to the need felt for the worker, and not because her increasing ability is a factor in her trade life. After several years spent in the market she is little better off than at her entrance.

Difficulties in Organization.

It was to relieve this serious situation that the Manhattan Trade School was founded. It began its work in the face of great discouragements. Employers were prejudiced against such instruction, for girls trained in former technical schools had not given satisfaction in the workrooms. The parents of the pupils felt that they could not sacrifice themselves further than the end of the compulsory school year, but must then send their children into wage-earning positions. It was impossible to obtain state or municipal aid, and it was known that the experiment must be costly, for: (1) A trade school must be open all the year for day classes, and for night work when needed, (schools usually are open from eight to ten months). (2) The work must be done on correct materials, which are often expensive and perishable, but pupils are too poor to provide them, therefore the school must plan to do so. (3) The supervisors must be well educated, with a broad-minded view of industry, capable of original thought and having a practical knowledge of trade requirements (women of such calibre can always command the best salaries). The teachers and forewomen also must combine teaching ability with competence in their workrooms, but as the market wishes a similar class of service and gives excellent wages to obtain it, the school must offer a like or even a larger amount. (4) Usually, teachers of highly skilled industries are expert in but one occupation, such as straw hat making by electric machine or jewelry-box making; hence, even if the student body be small, the teaching force can seldom be reduced without cutting off an entire department or trade. A trade school thus differs from a high school, in which two or more academic subjects can be taught by the same instructor.

Selection of Trades.

The selection of definite trades was made after five months' investigation in factories, workrooms and department stores of New York. The occupations chosen employ large numbers of women; require expert workers; involve training that is difficult to obtain; offer chances for promotion; pay good wages; offer favorable workroom conditions, physically and morally.

Slack seasons occurring in many otherwise good employments were considered and plans were made whereby the worker could be enabled to shift to another allied trade when her own was slack. If a girl gains complete control of her tool she can adapt herself to other occupations in which it is used with less difficulty than she can change to a trade requiring another tool.

Tools of Trade as Centres.

Women's industries, to a great extent, centre around the skilled use of a few tools. These tools were selected as centres of the school activities and the connected trades were radiated from them. The most skilled occupations were found to require the use of the sewing machine — foot and electric power, the paint brush, the paste brush and the needle. Statistics show that teaching the use of this last tool will affect over one-half of the women wage-earners of New York, of which there are at least 370,000. In addition to the general scheme of fitting a worker so that she may take up another allied occupation in slack seasons, specific training, for this purpose, is given to those students who choose trades where the busy season is short and of frequent recurrence.

The curriculum includes instruction in the following trades; the courses are short and the teaching is on trade lines.

I. Use of electric power sewing machines.

1. General Operating—(cheaper variety of work—seasonal, fair wages. Better grade of work —year round, fair and good wages, piece or week work): Shirtwaists, children's dresses (cloth and cotton), boys' waists, infants' wear, children's clothing, women's underwear, fancy petticoats, kimonos and dressing sacques.
2. Special Machines—(seasonal to year round work, depending on kind and demand, wages good) : Lace stitch, hemstitching, buttonhole, embroidery (hand and Bonnaz).
3. Dressmaking Operating—(year round, wages good) : Lingerie, fancy waists and suits.
4. Straw Sewing—(excellent wages for a short season, but the worker can then return to good wages in general operating) : Women's and men's hats.

II. Use of the needle and foot power sewing machines.

1. Dress and Garment-Making (seasons nine to eleven months, and fair to good wages): Uniforms and aprons, white work and simple white embroidery,gymnasium and swimming suits (wholesale and custom), lingerie, dress embroidery, dressmaking—plain and fancy.
2. Millinery (short seasonal work, low wages, difficult for the average young worker to rise): Trimmings and frame-making.
3. Lampshade and Candleshade Making (seasonal work, fair pay): This trade supplements Millinery.

III. Use of paste and glue. 1. Sample mounting (virtually year work, fair wages); 2. Sample bookcovers, labelling, tissue paper novelties and decorations (seasonal and year round work, good wages); 3. Novelty work (year round work, changed within workroom to meet demand, wages good); 4. Jewelry and silverware casemaking (year round work, good wages).

IV. Use of brush and pencil (year round work, good wages): Special elementary art trades, perforating and stamping, costume sketching, photograph and slide retouching.

Note. Year round work, in general, includes a holiday of longer or shorter duration, usually without pay.

Entrance, Selection, Progress.

The school is open throughout the year in order to train girls whenever they come—the summer months being slack in most trades are especially desirable for instruction. The tuition is free and in cases of extreme necessity, a committee gives Student's Aid, in proportion to the need. Entrance to day classes for girls who are from 14 to 17 and who can show their working papers or be able to produce documentary evidence of age, if under 16, can occur any week.

Each girl who enters, after selecting her trade, is given a typewritten paper showing the possible steps of advance in her chosen course. She takes this home in order that the family may know what is before her. She can by special effort or by outside study lessen the length of her training. The first month in the school is a test time. If the girl shows the needed qualities she is allowed to continue.

During the month of trial her instructors decide what she needs and if her chosen trade is the best for her. The right is reserved to make a complete change if her health will not stand the one she desires, if she has no ability for it, or if she gives evidence of special talent in another direction.

Every student has, as a part of her trade education, such academic work, art and physical training as seems necessary; when she passes certain standards she is then allowed to devote full time to her selected occupation. It is not possible for a worker who has skill with the hand, but no education to back it up, to rise far in her trade.

Trade Art Instruction.

Courses in Trade Art were organized as a fundamental part of the instruction. Each trade has its own art, and the school has tried to adapt the work in the studies to each different occupation. It recognizes that the art applied in dressmaking differs from that in millinery, and

this again from that required for decorating jewelry boxes and calendars. It consequently offers each student the kind of elementary art training needed in her trade. The time is too short to develop designers, but it does help a girl to be more exact, resourceful and useful in her workroom, and often enables her to make a higher wage. A worker who can place trimming, adapt designs to new purposes, stamp patterns, draw copies of garments and combine color attractively, is especially desirable in her chosen employment.

Lunchroom Cookery.

The school has been able to prove that girls educated there can command a fair wage in trade, but that a longer time given to this training will enable them to obtain better positions and salaries. Hence an increasing number have been willing to remain longer, giving even a year or more to preparation. It was with this latter class that the time was ripe to offer some training in lunchroom cookery which could teach them what could be procured at low prices and yet be nourishing; how to prepare food at home, and how to use the hot table often found in an up-to-date factory. For this purpose, therefore, some simple additional equipment was installed and a daily menu was offered comprising inexpensive, attractive, wholesome dishes, at the lowest possible cost. Many of the students care for so little variety in food that all of the necessary elements for building strong, healthy bodies are not supplied, hence they are undernourished. They require encouragement to even try the food which is essential for improving their physical condition. The girls have taken great interest in their lunchroom cookery. They appreciate the inexpensive menus and admire the simple table decorations. Gradually they have given up spending their few pennies for poor fruit, cake, or candy at some cheap shop and now purchase nourishing dishes cooked by the students at the school.

Hygiene and Housekeeping.

The cooking course connects directly with the talks on hygiene. The plan of work is the following: (1) Twenty girls are chosen at one time. These work in two groups of ten each, and for six weeks have daily one-hour lessons. This gives them 30 lessons, which is almost equivalent to what the public school offers in a year but, being concentrated into daily work and practical use in the lunchroom, is of equal, if not greater, efficacy. (2) The students set the tables, cook a definite part of the lunch, dish the articles, prepare the counters, sell the various dishes, keep and report sales, and clear the counters afterward. The groups alternate in order that preparing food, watching its progress and taking it from the stove may be done by all with a minimum loss of time from their trade instruction. (3) The selection of girls to take the course is made from (*a*) those who can remain long enough in the school to combine trade training with the simple cooking course, (*b*) those who have such poor health that a knowledge of what to eat and how to cook it is the first consideration, and (*c*) those who are already little housekeepers in their homes as their mothers are incapacitated or dead.

Trade Workers as Instructors.

Trade workers are employed in the business shops connected with the various departments. These assistants have proved their value in making the best utilization of the order work. They facilitate the completion of the work on time, and help train the girls to feel responsible for their share of it. As the students work slowly at first, and as their hours in the shops are interrupted by other studies, the trade workers, when necessary, continue with or complete the articles while the girls are absent. They make possible the tradelike organization of the shops, for each one has around her her own little groups of assistants and teaches them while she also works. Constant repetition of the same process ceases, after a time, to be valuable to a student, hence her time must not be wasted by too simple work or by unnecessary details. It often happens also that an article may require expert work in its completion which the students cannot yet do; the trade workers select for each girl the process which will be of value to her and then do the work the students cannot do or should not do.

Orders Demanded and Filled.

The following lists will show the class of orders which have been demanded by trade and turned out by the school.

Operating Department Orders: 1. Trade Work:—ribbon run on webbing for suspenders, infants' dresses—8 different styles, children's aprons—2 different styles, hemstitching and embroidery for yokes, ruffling—hem and hemstitched, fagotting.

2. Individual Custom Orders:—dressing sacques, aprons—kitchen, gingham, and work, gymnasium suits, waists, children's dresses, corset-covers, drawers, skirts and chemise, sheets, pillow-slips, curtains, straw hats, fancy petticoats, kimonos, handkerchiefs, fancy neckwear, infants' outfits, boys' waists, quilting, hemstitching by yard, silk waists, and dresses hemstitched, tucking by yard, waists, collars, cuffs and cloth embroidered, initials on linen and monograms on saddle cloths; ruffling by yard.

3. Order Work for other Departments:—Dressmaking: machine work on nightgowns, corset-covers, drawers, combination suits, petticoats, kimonos, gymnasium bloomers, swimming suits, buttonholes, hemstitching on silk skirts, dresses, waists; bonnaz embroidery on dresses, waists; millinery: veils hemstitched; art: pencil and brush cases; office coats and overalls for janitors employed in school.

Dressmaking Department Orders: Aprons, petticoats, maids' dresses; machine-made underwear; collars and neckwear; nurses' uniforms; swimming, bathing and gymnasium suits; children's and baby clothes; fine hand-made underwear; plain shirtwaists, fine waists, afternoon gowns, street suits, evening gowns, cloth suits tailored.

Pasting and Novelty Orders: Mounting suspender webbing, mounting corset samples, pasting suspender tabs and sockets, case-making. Desk sets, lampshades and candleshades.

Art Department Orders: 1. trade order work: stamping, perforating, coloring fashion plates, stencil cutting.

2. Custom Work: Stencilling curtains, scarfs, table covers, sofa pillows; designing patterns for embroidery for table covers, doylies, bags, buttons, shirtwaists, skirts, parasols and chiffon scarfs.

3. Order Work for other Departments:—Decorating book covers, desk sets, boxes, dress trimmings—panels, lapels, vests; collars and cuffs, insertions for hand and machine; banding for hats, letters, monograms, designs for doylies, scarfs, curtains, work-bags.

SECTION 3: TRADE SCHOOL FOR GIRLS, BOSTON, MASS.

This school opened its doors in July, 1904, as the outcome of an investigation by a voluntary association of ladies among employers of young girls as to the need of a Trade School or Trade Training Classes for girls in Boston. It was conducted as a private enterprise until taken over by City and State in September, 1909. It is now conducted by a Committee as local representative of the State Board of Education. Its threefold object is: (1) to give a trade training to girls between 14 and 18 years who are obliged to become wage-earners, training them to enter trades and giving them greater opportunity for development and self-support; (2) to help them to understand their relation to industry, and to improve their condition morally, mentally and physically; (3) to increase their general efficiency, and relate this to home life.

The academic instruction includes Spelling, Business Forms, Business English and Accounts. Instruction is also given in Color Study and Design, in Hygiene and Physical Training and in Cookery.

Non-residents may also be admitted, but not to the exclusion of resident pupils. Students come from a radius of 20 to 30 miles. About 8 per cent to 10 per cent are supported by friends, who allow $3 or $4 weekly for living expenses.

All pupils are taken on probation for a month, and those who show no aptitude for any one of the school's lines of work are advised to withdraw.

There are two terms; the regular school term and a summer term during July and August. Sessions are held five days weekly from 8.30 a.m. to 5 p.m., 5½ hours daily being devoted to trade instruction, and about 2 hours to supplementary academic work.

The length of the course for the average pupil is one year. Certificates are granted to pupils who satisfactorily complete the work of the school and prove their ability in the trade elected.

Trades Taught.

There are four trades taught; each pupil elects one.

(1) *Dressmaking.*—Children's Garments, giving practice in construction, and in hand and machine sewing, including use of electric power machines. White Work Underwear, giving use of finer material; construction of larger garments; practice in more difficult processes; fine hand tucking, rolled edges, lace inserting, simple embroidery, etc. Fitted Linings and Shirt Waists; use of various textiles; shirt waist suits and simple dresses. Costumes, giving practice in dress finishing, simple braiding and embroidery.

(2) *Millinery.*—Plain Sewing, giving practice in hand and machine sewing, including special stitches used in millinery; shirring, velvet hemming, wiring, etc. Hat Making, summer materials, including linings, bands, frames, straw braiding; making of maline, chiffon, lingerie, and straw hats. Hat Making, winter materials, including buckram frames, fitted and draped coverings; making of felt, velvet, satin and silk hats.

(3) *Clothing Machine Operating.*—Clothing machines, with practice on straight away work, aprons, etc. Plain sewing. Garment Making on Electric Power Machines (no basting). Aprons, underwear, petticoats, kimonos, waists, children's clothing. Use of special machines, buttonhole machine, tucking machine.

(4) *Straw Machine Operating.*—Straw machines, including use of coarse braids, lappings, joinings, tip making, fitting of simple shapes to plaster blocks; use of fine braids, handling of delicate colors, braid combinations, and fitting difficult shapes to blocks.

Supplementary Studies, Teachers, etc.

The supplementary work required of each pupil comprises:—Spelling, Business Forms, Business English; *Textiles*—(processes of manufacture; judging kinds and qualities of materials; learning uses, widths, prices, etc.); *Color Study and Design* (applied in copying and planning hats and costumes; judging good and poor design and color combinations; selecting materials in color schemes; designing simple costumes and making practical designs for braiding and embroidery); *Cooking* (planning, preparing and serving the daily luncheon; care of lunch room, kitchen, dishes, closets, towels, etc.); *Physical Exercises*, with lessons on the care of the body and the necessity of proper food, sleep and exercise. Emphasis is laid on correct postures in sitting, and on the need of fresh air in the work room.

The length of course is usually one year, but it varies in cases from ½ to 1½ year. It is hoped to established a 2 year course and a graduation diploma.

Actual cutting and tailoring are not taken up. The dresses made are house dresses or those adapted for evening wear.

There are 19 regular teachers and 10 pupil-teachers in training. The professional or trade teachers are obtained from such as forewomen, etc., in the trade; the academic teachers have the ordinary Public School qualification.

The school building, originally used as a convent, is well adapted for school purposes. It is equipped with a fire alarm on each floor. A fairly large hall is used for opening exercises, physical culture, etc. (Students have regular games, and dancing in addition to the regular physical culture exercises). The power room is designed to seat about 50 students at 2 long tables extending the full length of the room. The cooking department is also utilized to provide (at practically cost prices) lunches, etc., at 10.30 a.m. and at mid-day. Laundry work is confined to school towels and aprons.

A business-like attitude prevailed throughout the school.

Incentives to students' effort are the making and selling of products as well as making garments for themselves from their own material.

Every Friday from 3.30 to 5.30 p.m. a social meeting is held at which addresses on the pupils' work are given by prominent visitors.

Pupils Placed on Graduation.

When the course is completed and the pupil has attained a satisfactory standard of proficiency, an effort is made by the Principal of the Committee and 2 vocational assistants to place her in a permanent position. Each is recommended at a certain wage, and the employer asked to guarantee it to her for two weeks, and to report to the school at the end of that time if she is not satisfactory. The girl also is asked to report either progress or difficulty. As a rule, employers are more than satisfied, but if not, the girl is permitted to return to school until she has overcome any deficiency. In this way the school establishes confidence between itself and employers, and often receives from them helpful recommendations relative to its work.

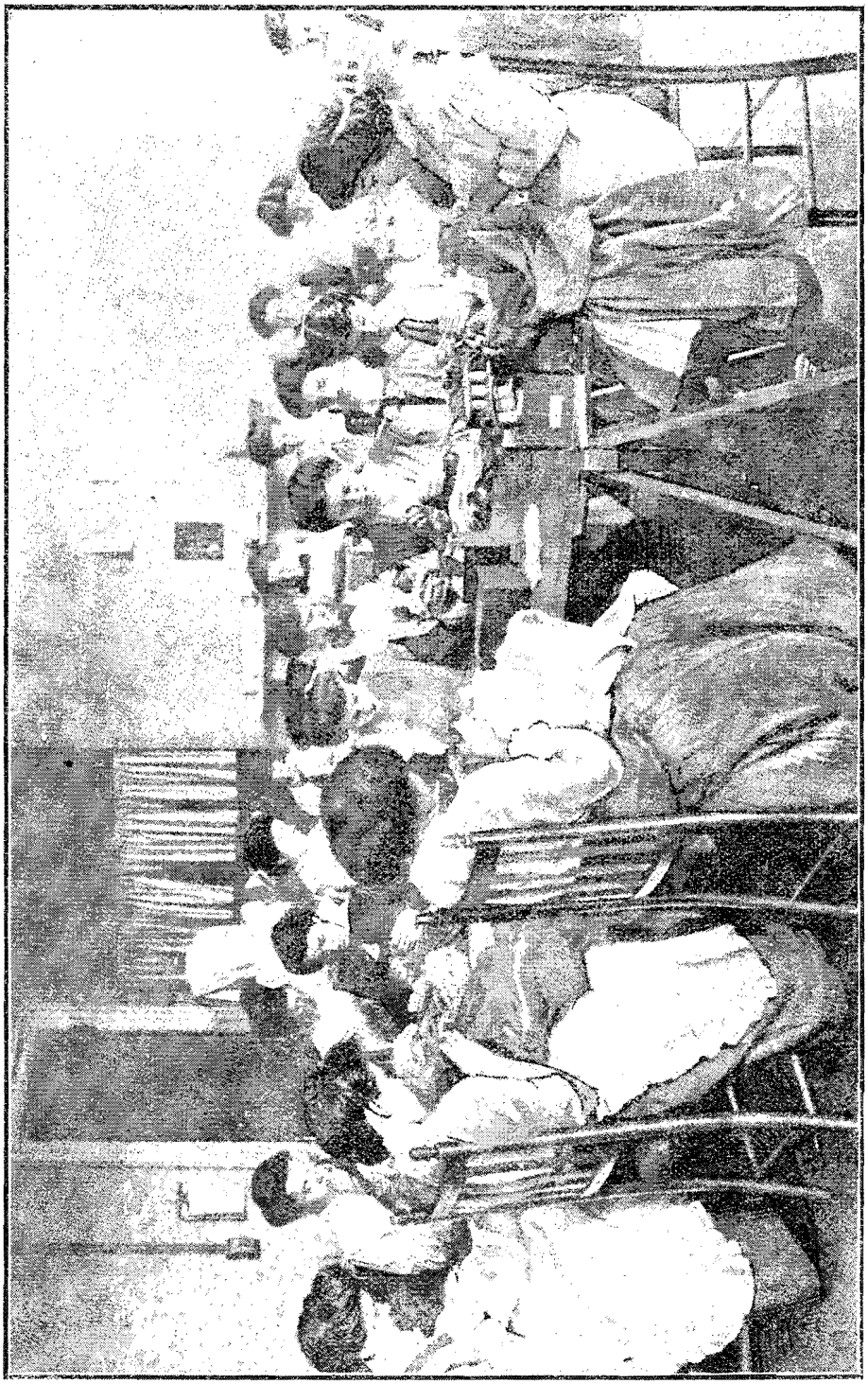
Between September, 1910 and April, 1911 about 60 girls were placed at an average wage of $5.70, and nearly all are doing more than satisfactory work. A number who have not completed the course went out on part time, spending one week in the shop and the next in the school, until their work was entirely satisfactory and the employer was willing to guarantee the minimum wage, $6 weekly, barring special cases. The comparative average weekly wage of 108 girls taking positions from September 14, 1910 to June 21, 1911, was as follows:—Placed by School, $6.16; self-placed (those who from necessity or choice secure positions for themselves before their training is completed) $3.43.

Health, Culture, Character.

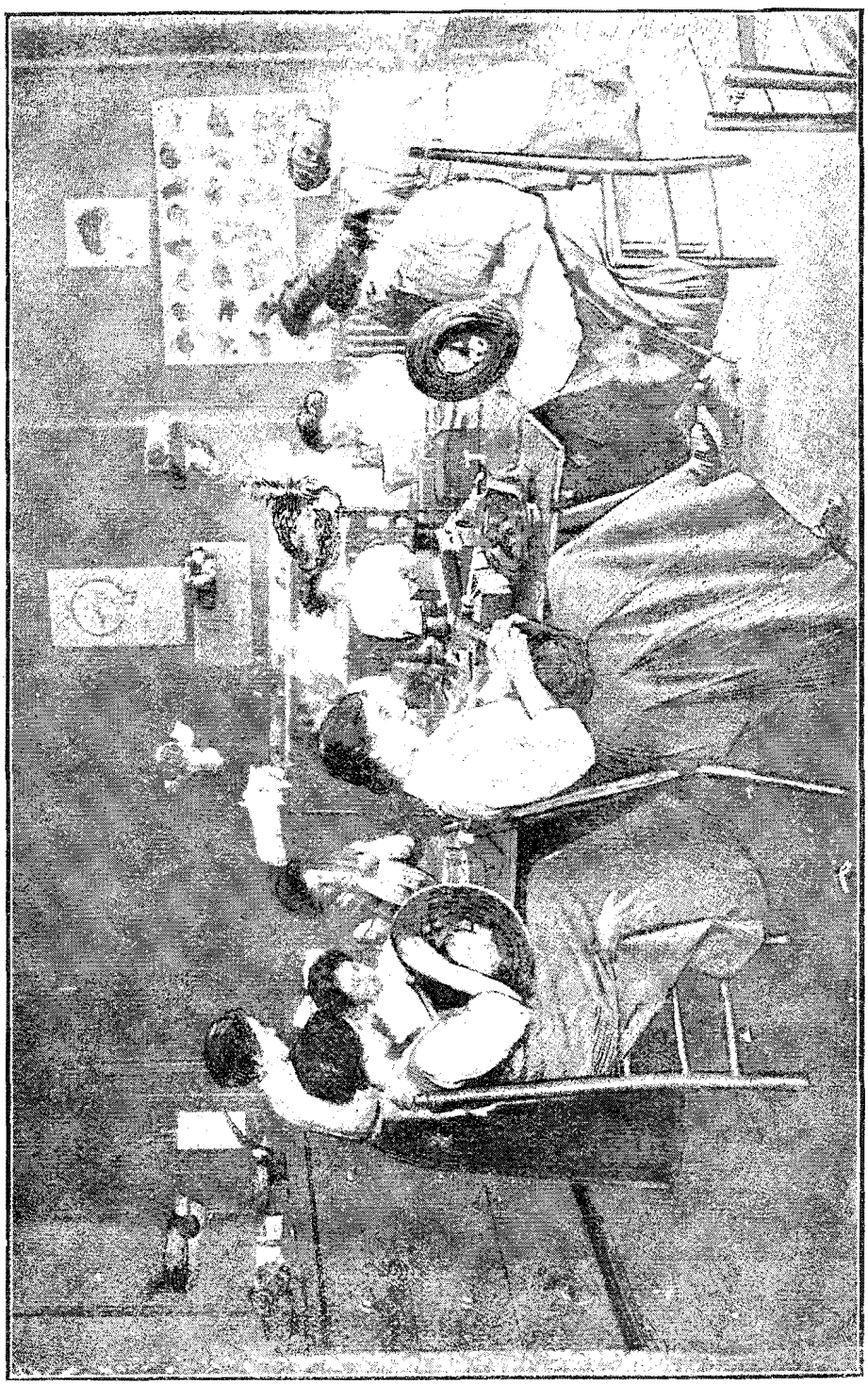
While it is a definite trade school for girls it also does much toward their improvement in health, culture, and character. It has all the advantages of the best of educational life. Everything taught has in view as much the effect upon the girl who learns, and the way she learns, as upon what she will earn by what she learns. It is all as genuinely educational as vocational. Dr. A. E. Winship, Editor of the "Journal of Education" states:—"It is not easy to find a culture school where the spirit from first to last is more inspirational than here. Rarely does a girl in any school come in closer touch with inspiring leadership than here."

The school has evening classes during the winter, open and free to students over 17 who are not attending a public day school and are able to profit by the instruction offered in Cloth Machine Operating, Straw Machine Operating, Cooking, Household Management and Economics.

The school offers opportunity for power machine operators to learn machines with which they are not already familiar, and to increase their speed and efficiency in their present work; also for homemakers, housekeepers and domestics who wish to improve themselves in their vocations.



DRESSMAKING CLASS, TRADE SCHOOL FOR GIRLS: BOSTON, MASS



MILLINERY CLASS, TRADE SCHOOL FOR GIRLS: BOSTON, MASS.

SECTION 4: VOCATIONAL SCHOOL FOR GIRLS, ROCHESTER, N.Y.

This school was opened in 1909 by the City Board of Education and the State authorities as a school for home-makers, but the plan proved unsuccessful, as pupils thought they were being trained for domestic service and became dissatisfied. The tendency of other schools to send their undesirable pupils to this school added to the unrest; hence in 1910 it was entirely reorganized, the home-making course being made incidental to the primary purpose of the school instruction in Sewing, Dressmaking and Millinery.

The school is free, and is open from 9 a.m. to 3 p.m. on 5 days weekly from September to June. Any girl of at least 14 who has finished the sixth grade may attend, and may enter at any time.

All pupils are required to devote 5½ hours weekly to Cooking; 11 hours to Trade Practice work; and 13½ hours to such subjects as Arithmetic, English, Industrial Geography and History (including Civics), Spelling, Designing and Hygiene, these subjects being closely correlated to vocational work.

In December, 1910, 27 girls were receiving instruction in Dressmaking, 14 in Millinery, and in addition 16 were taking the Home-makers' course, with practice time evenly divided between Dressmaking, Millinery and Cooking.

In introducing Dressmaking and Millinery, local industries were not especially considered, but rather the general demand for girls skilled in these trades. The training given, which covers 2 years, is planned to make them efficient helpers or assistants.

Pupils work out designs in millinery or dressmaking. The work in design s carried on along with the other departments.

Complete Garments and Meals by Pupils.

Garments and hats are made from materials furnished by the pupils, and are retained by themselves.

Several school hats were shown, one costing 55 cents, the girl having had the velvet. She had put on a ribbon; with everything complete it cost 88 cents. Handbooks were worked out from the girls' own designs. Violet flowers and tops of hat pins were made out of ribbon.

In Dressmaking, all work is ordered; any one can give orders as a customer of the school for work to be done. Each girl makes a complete garment from start to finish, so there is a broad base of work; the girls thus become independent workers when they graduate. Fancy needle work, bags, aprons, etc., were for sale for the benefit of the school.

In Domestic Science work the pupils prepare a lunch each day which is bought by students; they also serve lunch to women who come in. There is no feeling in the city that the girls are getting inferior education. They are here because their parents wish it, and because they are getting something they could not get in any other school. They get as much Arithmetic, Spelling and Literature as they would in a Public School. The Principal said most of these 100 girls would not have gone to High School, but would have left school altogether.

SESSIONAL PAPER No. 191d

SECTION 5: TRADE SCHOOL FOR GIRLS, WORCESTER, MASS.

This School was established in 1911, under the State and City ordinance providing for Independent Industrial Schools, under the management and control of a Board of Trustees after an investigation of local industries and needs.

It is for girls who desire an education that will prepare them for industrial work as distinguished from office work and teaching. Pupils learn the elements of a trade, getting training that will enable girls of 14 to increase their earning capacity, and that they could not get if they started work as unskilled apprentices. They study also such academic subjects as are related to their trade work. Girls who have not completed grammar school work may be admitted on condition that they show ability for trade work.

The school is open (except during August) from 8.30 a..m. to 4.45 p.m. five days weekly. There are no home lessons.

It is held in a splendid old mansion house of 28 rooms, including 2 well-equipped kitchens and pantries and a basement laundry with stationary tubs and sink.

Physical culture and cooking are on the courses—the latter chiefly for the daily luncheon, which the girls cook and serve at cost. At noon-hour the girls read and dance.

Of the 72 pupils, 36 were taking power machine work, 18 plain sewing, 18 millinery. Three types of dressmaking are taught,—plain sewing; seamstress work as in going about from house to house; and such as is done in dressmakers' establishments. Fine sewing on corsets being a local industry, girls are trained for that, and for fine hand sewing which is needed by successful milliners. A bonnet was shown, and figuring the making at $2 it cost $3.05; in a shop it would sell at $7.75.

The trade work is conducted in school shops where hand and machine work is done on garments that are sold. Materials for work and tuition are free. The atmosphere of the school is that of a home rather than a factory. Two years later a "shop" atmosphere will be created.

It is proposed to add pasting and glue work, as there is a large Valentine factory in the locality; also training girls for cooking, for lunch rooms, as helpers in hospitals, etc., for which the Worcester people seem well prepared. The dressmaking course is correlated to the academic and gymnastic work and cooking. A good many of the girls are workpeople. Older girls attend for 3 hours a day and get hand work. Some factories send girls to the school for training. The principal claims that employers would get nearly as much by sending girls part-time as in keeping them full hours in the factory, because the school would "work them up" so much faster. Many girls attend for personal advantage, apart from trade.

In the first year all take Cooking and Art, but in the second year the work in Cooking, Art and English is elective.

COURSES.

Trade.—Sewing, millinery, electric power machine operating.
Academic.—Arithmetic, English, textiles, spelling—all as related to the several trades—civics, and apportionment of incomes. *Art.*—Form, spacing, proportion, line and color, as related to trade work; applied design, costume and hat designing. *Cooking.*—Buying, preparing, serving of foods for the school luncheon, planning simple menus, canning and preserving. *Physical Education.*—Light gymnastics, dancing, personal hygiene. Care of eyes, teeth, throat and ears. Corrective exercises.

A representative committee of 15 men and women act as advisers. Some of these are familiar with the trades taught, and others are interested in the work of the school and cognizant of social and industrial conditions in Worcester. In this way, the administrators of the school are kept in close touch with the community, and especially the needs of those groups to whom the school can render special service.

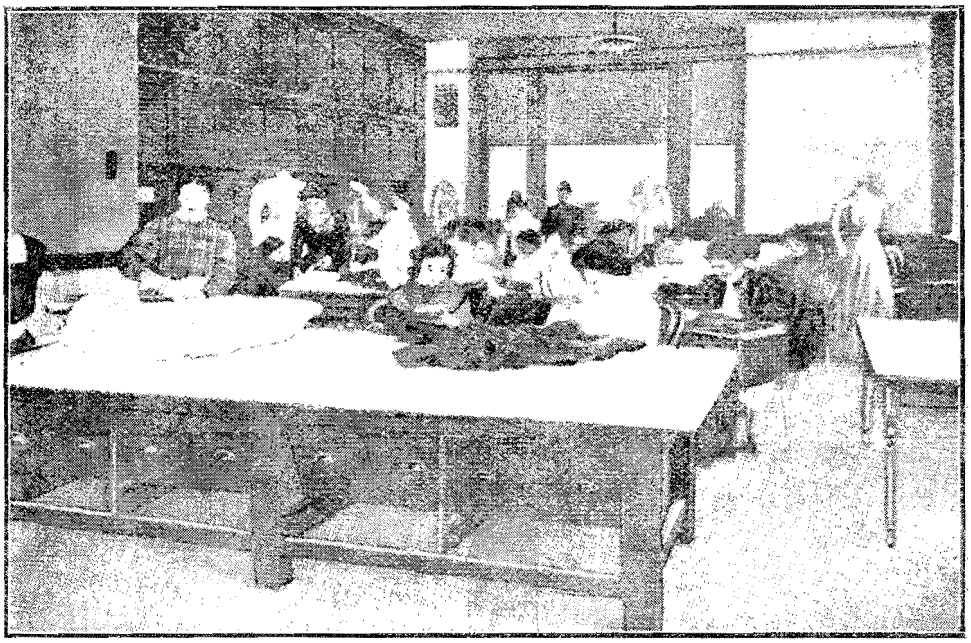
SECTION 6: THE HEBREW TECHNICAL SCHOOL FOR GIRLS, NEW YORK.

This claims to be the oldest vocational school in the United States, having begun operations 8 months before the Pratt Institute, Brooklyn. Mrs. M. D. Louis, the founder of the institution, is today its secretary. It began as a Hebrew Sunday School in 1881. For a long while it existed as a little commercial and sewing school at 267 Henry Street. About 7 years ago the present fine building was erected at Second Avenue and 15th Street. The school is supported by voluntary contributions.

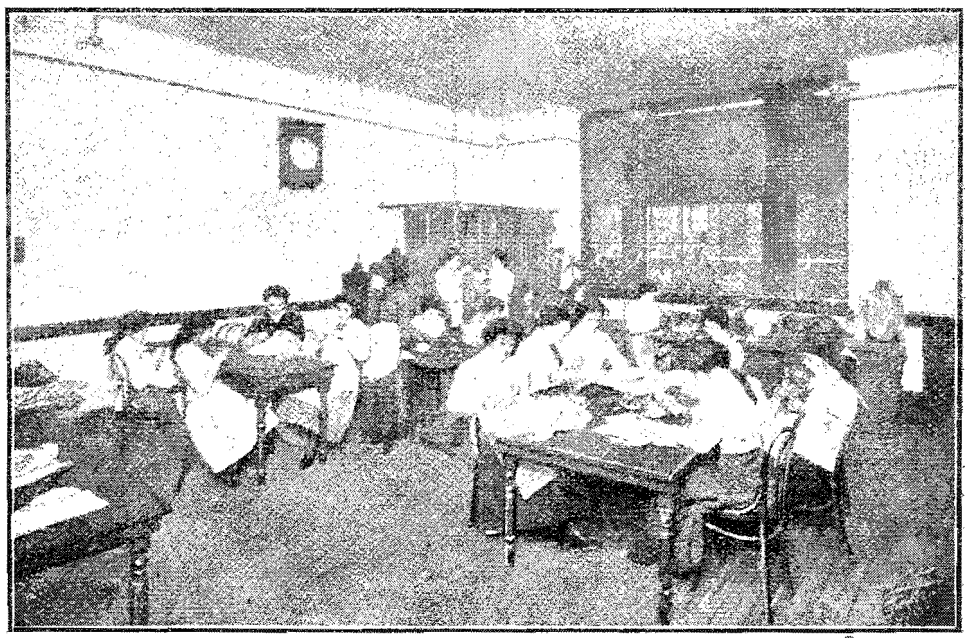
There are two departments—Manual and Commercial. In the former there are 17 periods per week of 45 minutes each for Dressmaking, given in the last 6 months. Millinery is given to each girl on two days, 3 hours each week. Attention is paid to Sewing and Embroidery, Drawing, Cooking, and Household Art in connection with the Cooking throughout the course. Physical Training consists of gymnastic work and swimming in a large swimming pool. There are 3 periods for Choral Music, also a series of musical lectures.

Literature and History are taught in correlation throughout the course. Physiology is given in the first 6 months, emphasis being given to hygiene and home sanitation. Arithmetic is given daily, largely in correlation with the problems that arise in the Manual Department. English Grammar is taught in connection with the English Literature and History. Penmanship is given 3 periods per week during the first 6 months.

The Commercial Department gives Stenography, Typewriting, Modern Illustrative Book-keeping, Office Work, Penmanship and English. During July and August the programme is varied so as to devote half of the time to Physical Training or recreation work, 4 periods being given daily for Shorthand, Typewriting and English, and one each for Vocal Training and Elocution, Swimming, Dancing, and Gymnastics.



A Dressmaking Class.



A Class in Sewing: Hebrew Technical School for Girls, New York.

School Shop, Teachers, Etc.

School hours are from 8.30 a.m. to 4 p.m. on 5 days a week. Of a total of 32½ hours per week, 15¼ are given to practice work, 9 to academic subjects, 1½ to cooking, and 6¾ to physical training, ethical training and music.

Only the fundamental principles of the trade are taught, the practice having to be acquired in the trade itself.

In the Manual Department pupils are first taught the rudiments of sewing. As they become proficient they make simple garments, which are sold to them at cost price; then they go on to more elaborate work and hand embroidery, and make garments for customers. All girls get some instruction in millinery, and at the end of the more elementary work can begin to specialize on either millinery or dressmaking.

A school shop has recently been established to provide further practice for girls after finishing their dressmaking course, in which they remain 6 months, being paid a small wage, increasing from $2 upwards.

The greatest demand for graduates comes from the smaller manufacturers and shops where careful work is required; larger ones will not pay the wages asked.

Of the 6 trade teachers employed in 1909-10, 2 had had actual experience in the trade, and all had previously taught it. Great need is felt for a Normal School for Industrial Teachers.

The school is non-sectarian. Of the 27 or 28 teachers, only 3 are of the Jewish faith. 'Discussion periods' are held one period per week throughout the course, in which questions are discussed with the pupils pertaining to honesty, truthfulness, punctuality, regularity, etc.

More Applicants than Vacancies.

There are five times as many applications for admission to the Commercial Department as there are vacancies, and from one and a half to twice as many for the Manual Department as there are seats. A girl who has lost both parents stands first chance; one whose father is dead, second chance; if mother is dead, third chance; the child of a poor laborer with a family to support stands next. Four-fifths of the children come from the poor of the East Side. 75% are Hebrew; 20% Catholic; 5% Protestant. The entrance examination consists of 20 words in spelling; 5 sentences embracing a page of dictation; some addition, and five or ten problems in arithmetic.

In the Commercial Department the pupils must have completed the grammar school; in the Manual Department they must have passed 7 A and gone up to 7 B. After this examination, girls are sized up and allotted to the Manual or Commercial Department; then they are sent to a medical examiner, who gives the pupils four examinations—first at entrance and three times during the course. Those who are anaemic have corrective gymnastic exercises; the strong and heavy have club exercises; those who come between are given lighter hand work.

In order to make pupils feel they are not getting charity, and have a little responsibility at home, a weekly fee of 25 cents in the Commercial and 15 cents in the Manual Department is charged; 10 cents goes for refreshment, each girl receiving a cup of cocoa or a glass of milk at 10.30 a.m. daily, and another at luncheon period. Each girl is requested, but not required, to pay $2 into the endowment fund during the 18 months of school attendance or afterwards; about $10,000 to $15,000 of this fund has been thus contributed.

A distinct feature of this school is that if a pupil should meet with reverses so that she would have to leave school if not helped, if she is well up in her work she receives from the stipendiary fund from $1 to $5 per week; but out of 465 on the list, there are only 10 on the stipendiary list.

Individual Methods, Mother Teachers.

No girl drops out of school without her teacher or the Superintendent knowing why, and the total loss in this way is not 5%. Each September and March a class of from 140 to 150 graduates. The Employment Bureau finds positions for practically all the girls before they graduate. No girl is allowed to go out at less than $5 a week, and the school investigates employers very carefully, and sees that none is sent where there is danger to her reputation. When girls get positions, they report each year where employed, salary per week, etc., and track is kept of every one.

Another distinct feature is that students are divided into classes and have 'Mother Teachers', along with their class teacher, through both junior and senior terms for 18 months, to whom a girl may complain if not receiving proper treatment from the teachers. Substitute teachers are employed through July and August, thus giving the regular teacher a month's vacation.

This school aims to do as much in the 18 months as the ordinary High School in 2 years. If pupils can leave the city and go into the country, they are allowed two weeks vacation during July and August; with this exception, and a week's vacation each at Christmas and in Passover week, the session is continuous for 18 months.

The Superintendent drafts the curriculum in consultation with the Instruction Committee. Each teacher is left free to use her own personality and individuality in her methods of teaching.

Visit to the School.

A visit was made to the School with the Superintendent.

Dressmaking Department.—Beginners were making simple underwear; talking about different material; trying to find out how the girls would understand difference in materials—one girl said she thought by the touch. There are no exercises for the development of the faculty of touch. Other girls of 14 to 15 were working first at baby dresses, then fine underwear, which is sold at sales and at the stores; garments are worked as a class problem, and all involve the same principles, so as to give the problem along with class instruction. Before this they take individual orders, which is better for the girl, as involving problems. The school has no trouble with the trades people of the city, as it only sells 30 baby dresses in a term, at $2 to $4.50 each, when they may cost $2.

Physical culture.—There is a Roof Garden for basket ball, a Gymnasium with all apparatus, and a running track. Two days in the week the girls are taught dances and steps in companies; a regular dancing teacher comes in the summer time.

The school kitchen is used for cooking luncheon and serving teachers' luncheons at 15 cents each. A class divides into two sections, each working 3 months.

Order Department.—School graduates were working here having returned to become more efficient in dressmaking. Orders are taken from Directors and friends of the school, and given to the teacher in charge. The school pays $10 a week to some girls. Some have been there 5 or 6 years.

Time-slips are pinned to each garment, showing entry number, job number, day of week, time spent, the amount of money paid, if any. There is a ready sale for maids' aprons, caps and collars. The girls are said to make things best in an educational way.

Senior girls make dresses for teachers in one month without cost, the teachers furnishing the material, the embroidery teacher making the design. Designs were made by the teacher for needlework on neckbands and collars. Girls were making their graduating dresses.

A Teachers' Rest Room was a feature noticed.

A Reference Library is available for pupils of the senior class.

Embroidery.—Specimens 150 years old were shown. Each girl brings the stitch, puts it on a sampler to keep for reference; then makes it in color, using the scallop and the shape she has learned; then a second sampler showing the different ways of doing simple decorative stitches. The girls are taught where these can be used, and they are applied as far as possible in the work they are doing. After stitching, the girl does fagotting; then she is shown how she can use this fagotting. Then the girls take up lettering, German letters first; they are shown where the German letters are better than the French; then they take up the French raised lettering, which requires much more skill and accuracy in line work and direction of stitch. By the time they have done this they are ready for their junior work, which is application of embroidery to baby dresses, collars, cuffs, etc.

SECTION 7: HIGH SCHOOL OF PRACTICAL ARTS, BOSTON, MASS.

The purpose of this school is to give full opportunity for the development of that type of students whose talents lie in lines of doing and expressing rather than of acquisition. It is a High School with a Practical Arts Department, having a 4 years' course, with 30 periods a week—3 lessons in sewing and 2 in cookery and housewifery.

The school tries out the girls for the first year and sees what they are fitted for. Some of them choose Domestic Science, which includes cookery, housewifery and the care of the home. They also get some "home" dressmaking and millinery as distinct from the trades; but a girl taking this course is evidently aiming to make herself a competent housekeeper. Another girl chooses Dressmaking with a view of going into the trade to earn her living when she leaves school; hence for the next 3 years she devotes her industrial effort to that one trade, also taking some Domestic Science, because such a girl is very likely to marry—7 years being about the average time spent in the trade before marriage. The Milliner also takes her trade course, together with some sewing and some Domestic Science. They must take all three, but they "major" in one. Some girls go to the Normal Arts School to develop drawing. The purpose is to educate a woman and give her a training different from the old type.

The School is in its 15th year. There were 560 pupils in 1911; 39 graduated in June 1911, and about 80 would graduate June 1912. Out of the 560, 8 were taken back into the school as helpers in kitchen and sewing rooms. They will probably become teachers eventually, and some will go into dressmaking and millinery shops.

The school tries to place its pupils in shops where they will rise, believing that in about 4 years they will become forewomen.

A Practical School Atmosphere.

The atmosphere of the school and the appearance of the girls show that there is a seriousness of purpose, and that the womanly qualities are being brought out. They do their book work so much the better for it. In arithmetic they study the problems of everyday life—weights and measures, computations of cost of things in the kitchen. When handling muslin, they feel the fabric and know the value. Principal Weaver examined one of the girls on a piece of cloth, as to price per yard, nature and quality. The girl said, "I know this is shirting, because there is a white stripe in it. I went and bought it on my own responsibility; it is a piece of men's shirting. It is for a waist. We have not got all the buttons yet, but it has taken about 3 yards of cloth, costing about 90 cents, and the whole thing will cost about $1.25." Another girl had picked up some gingham for which she had paid 32 cents a yard. She said it was easier to get a stripe than a plaid. Another was drafting a skirt pattern for a long dress, she was going to buy from sample a navy blue serge for $1.50.

They make tailored suits here. All the work is cut out and laid out in the girls' presence by the teacher. The trade is taught in detail up to the tailored suit, one of which was on exhibition. The sewing tables arranged for 4 pupils were simple and inexpensive, and much better than the horseshoe plan.

A sample time ticket was obtained. The girls furnish everything except the needles and the machines, and the girl keeps what she makes. If she cannot afford to buy the material, the school furnishes it, and she makes it up, and the school owns it. The fact that the school has nothing not disposed of shows the condition. They begin on underwear, aprons, shirtwaists; get to washing materials the second year; the third year silk and wool; the fourth year tailored garments. That is for those who are taking it regularly; the others are making graduating dresses and things of that sort.

COURSE OF STUDY.

The course of study is presented under two general heads—academic and industrial—and usually demands 4 years for its completion.

The course of study during the first year is the same for all pupils. During the three years following no electives are offered in the academic work except a choice of French or German, but the pupils are allowed to choose different lines of vocational training.

The Academic Departments are English, History, Mathematics, Science, French, German, Art. The Industrial Department at present offers these courses: Dressmaking, Millinery, Household Science. The latter is offered to girls who desire to make an intelligent study of the home from the standpoints of sanitation, furnishing, decoration and care. The Dressmaking and Millinery courses aim to give ideals, taste and skill which shall have money earning value for the possessor.

First Year.—*Required.*—(Total periods per week 28, as shown in figure opposite each subject)—English 5, History 2, Mathematics 4, Art 4, Sewing 6, Cooking and Housewifery 4, Choral Practice 1, Physical Training 2.

Elective.—None.

Second Year.—*Required.*—(20 periods)—English 4, History 2, Foreign Language 3, Chemistry 4, Art 5, Choral Practice 1, Physical Training 1.

Elective.—Dressmaking Course 10, Millinery Course 10, Household Science Course 10.

THIRD YEAR.—*Required.*—(20 periods)— English 4, History, Civil Government 2, Foreign Language 3, Biology (one-half year) 2, Physics (one-half year) 2, Art 5, Choral Practice 1, Physical Training 1.

Elective.—Dressmaking Course 10, Millinery Course 10, Household Science Course 10.

FOURTH YEAR.—*Required.*—(20 periods)—English 4, Foreign Language 3, Household Accounts (one-half year) 2, Home Nursing (one-half year) 2, Economics 2, Art 5, Choral Practice 1, Physical Training 1.

Elective.—Dressmaking Course 10, Millinery Course 10, Household Science Course 10.

The English Course aims to develop the speech, intellect, taste and spirit of the students, so that they shall be able to speak the English tongue with a fair degree of precision and grace; to think logically; to read with pleasure and appreciation the works of standard American and English authors; to teach them to select good books for reading and to live in the possession of fine ideals.

In the English class for 14-year old girls the teacher was reading a girl's production in the form of a sonnet, illustrated by postal cards from the Rocky Mountains. This sonnet had been submitted by the pupil in draft form, was returned to her to "work over," and was now being read as revised. Mr. Weaver asked the girls as to their interest in Ruskin, Shakespeare, Milton, etc., and they responded affirmatively.

Art.—The purpose of this course is the cultivation of taste through a study of the principles of beauty and their application to the problems of dress and the home. It includes representation, construction, mechanical drawing, composition and design, costume design, and household decoration and furnishing. There is a library of design.

Drawing is specialized for Domestic Science, Millinery and Dressmaking. Pupils in second year were working on designs of graduation gown, cost limited to $4; all to be similar but not alike. One girl who was a little deaf has gone into making designs for newspaper advertising at large figures. Color of eyes, hair, etc., are studied in millinery work. Designs of embroidery and drapery were shown, also color schemes for rooms and furniture, monograms, menu cards, window bills, etc.

Millinery.—The girls work according to shapes of faces and color of hair. They work from buckram frames, wire frames, and miniature designs.

Household Science.—The object of this course is to train girls in all that pertains to the art and science of practical housekeeping, and practice is given in the care of the house, cooking, marketing, planning meals for families and institutions, with such sewing and millinery as will guide pupils in the selection and making of their own garments. The Commissioners visited the rented residence across the street from the school, where girls take full charge of housekeeping, meals for teachers, etc.

Practical Physics.—Different systems of heating are taken up and studied. Girls run the furnace at home for a day or two and study its points. They learn how to place a hot water radiator to get the best results. They draw up schemes of plumbing for their own houses. They investigate the Boston milk and water supply, dust and sanitation. They do some work in dyeing —chemistry as applied to fabrics, etc. They study tests for lead; draw off water and work over the settlings and see what is in it. Mrs. Governor Foss looked at the drawing made by a pupil and asked where the shut-off was in the plumbing. The girl pointed it out, and Mrs. Foss then told how they had a break in their own house and had to let the water run till the plumber came.

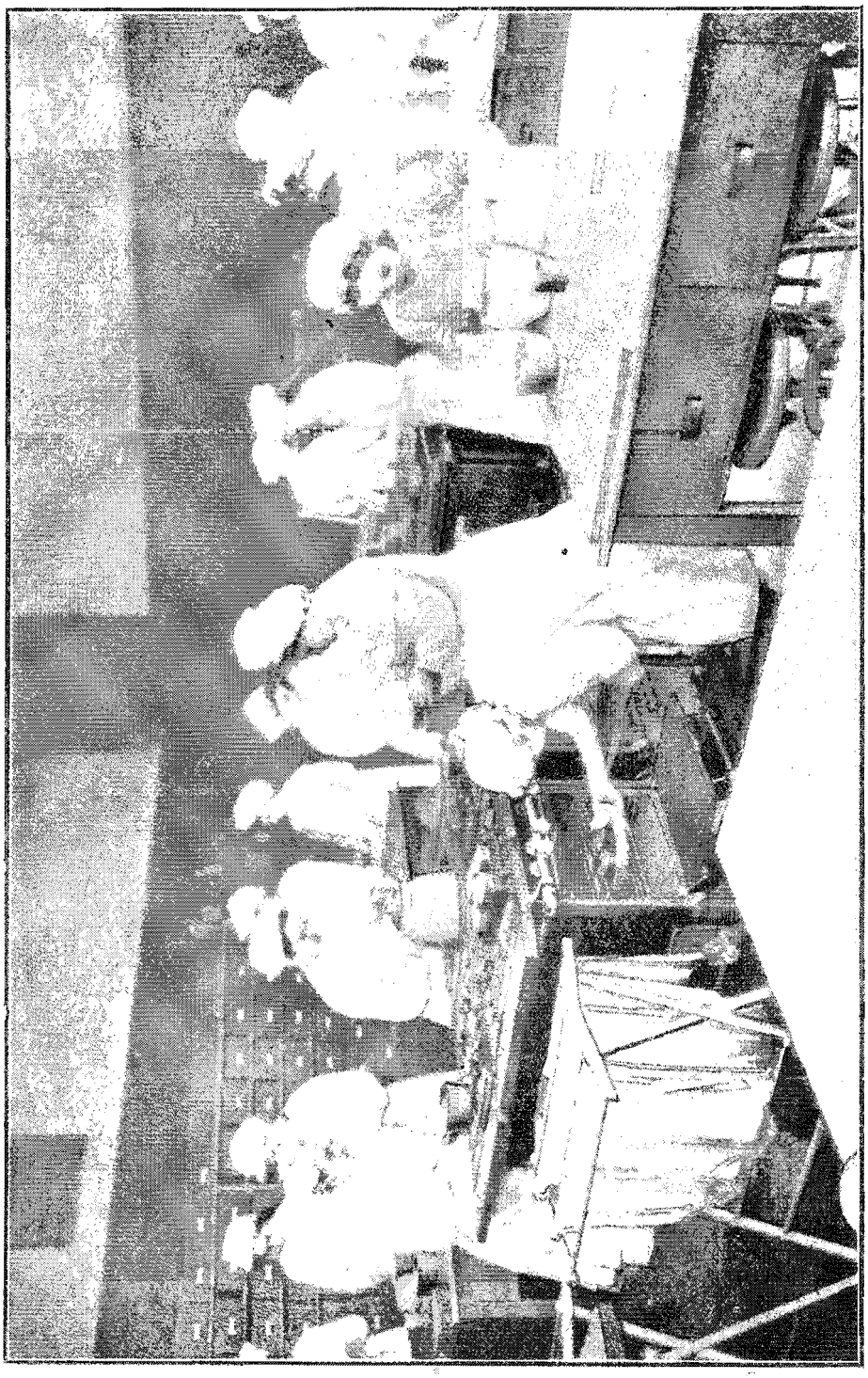
History.—Special attention is given to the history of the development of arts and industries.

The Science Course aims to put the student in touch with the scientific problems of life. In every branch of science, attempts are made to teach application quite as much as theory, e.g., pupils learn the bleaching of straw for hats.

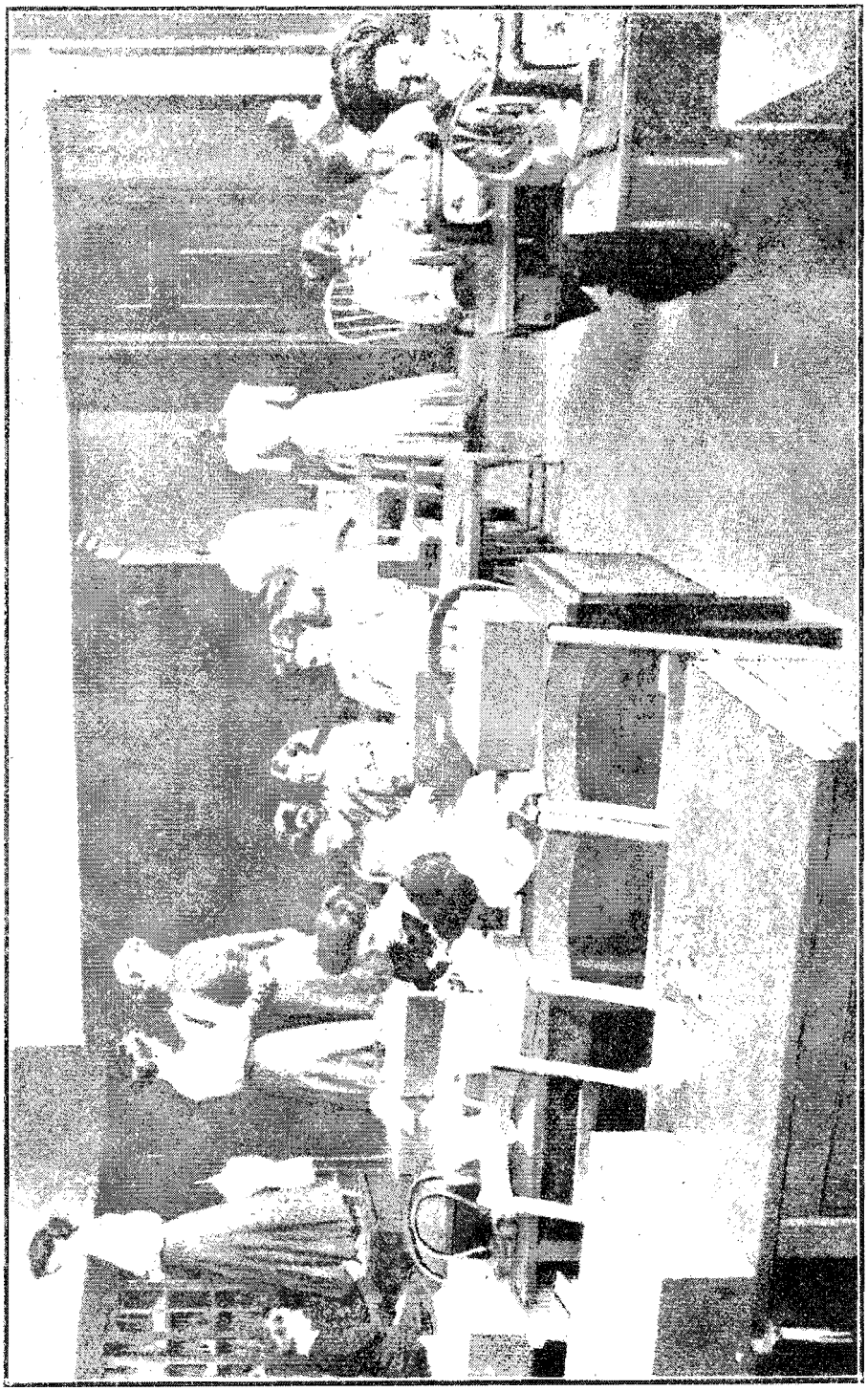
The Mathematics Course aims (1) to train girls to think logically and clearly, and (2) to enable them to solve simple problems. In turning over hems, etc., they get arithmetic. Household accounts are taken in the last year. In the second year they have some algebra because Principal Weaver wants some work that teaches the girls to think logically and work exactly, and algebra is a good subject. In the second year they take some geometry, which is tied up with their drawing, drafting, etc. In their science also they get some mathematical work. A lot of mathematics are taught, not for the sake of teaching mathematics, but to mentally strengthen and stimulate the girls.

SYSTEM IN COURSE OF HANDWORK.

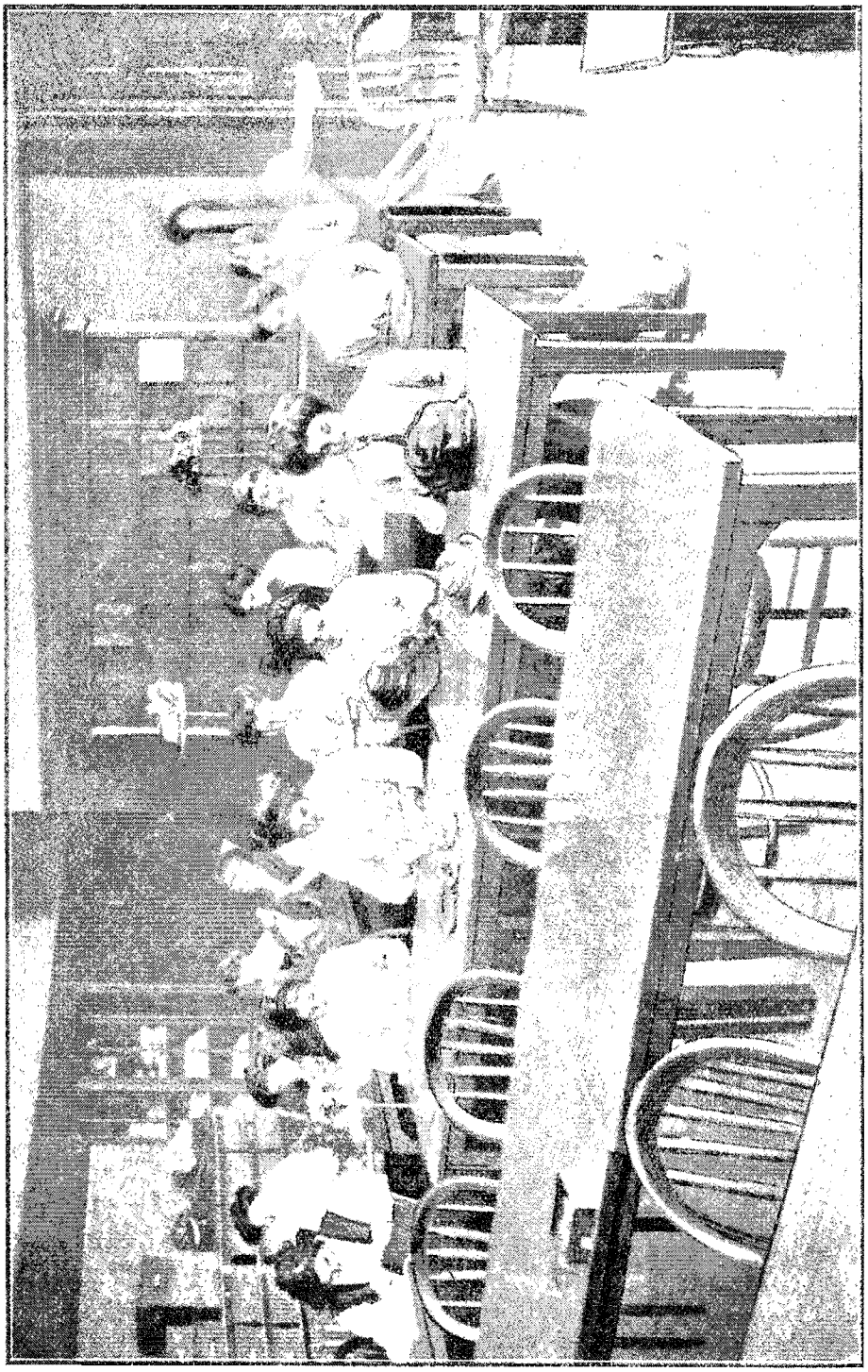
Principal Weaver, pointing out the difference between Manual Training and this industrial work, said he had been a teacher in a Manual Training High School for boys, who would take a little carpentering, and about the time



ONE OF THE COOKERY ROOMS, HIGH SCHOOL OF PRACTICAL ARTS: BOSTON, MASS.



THIRD YEAR DRESSMAKING CLASS, HIGH SCHOOL OF PRACTICAL ARTS: BOSTON, MASS.



MILLINERY DEPARTMENT, HIGH SCHOOL OF PRACTICAL ARTS: BOSTON, MASS.

they got used to that they went to woodcarving; then they had some wood-turning and forging and machine work and, by the time they got through, all that they had was a smattering of handwork just like a smattering of bookwork. Jumping from one thing to another in bookwork, he asserted, leaves the mind illogically trained; and you can hop around in the same way with handwork and leave the hand weak.

In this school, however, a girl devotes herself for 3 years to the problems of Dressmaking, Drafting, Fitting, Cutting; studying the subject logically, not taking a few weeks of Drawing and Embroidery and Latin. Hence the hand, eye and mind are trained on that one thing thoroughly just as on Mathematics or History, and when pupils get through they have that one thing. It is found that the girls by the time they are given a good deal of specialized work, are getting a good grip on things. Of those who take the dressmaking major, one girl measures over and puts down the figures, and she drafts and cuts and fits. That is where they get practice. The teachers are quick to find out about the girls in that way; and if they find Sally can fit, they wait for Sally.

The Teacher Problem.

The trouble is to get teachers, because regular academic teachers have not much sympathy with the methods here. For example, the plan of this school is to take up science and do scientific work for the home, so that instead of girls studying about chemical substances they never heard of, they learn about saleratus, olive oil, washing powders, etc. Then in physics they take heating, lighting, ventilating, water-supply, etc. In the English department the aim is to get the girls to love good literature, not to get them ready for college examinations. As a result they read and love Shakespeare, Ruskin and Thackeray, whereas many Latin Schools would grind them on the obscure parts of literature till they disliked it.

The trade teachers were 'picked up;' one or two being taken right out of the trade; the milliner was an old school-teacher first, but with the school's growth it becomes more and more difficult to secure teachers. A teacher of Domestic Science can be found more easily than one for sewing and cooking. A woman who is expert with her hands may be almost illiterate. A young school graduate has been taken in as special assistant, having taken Domestic Science during her course, and she is going to train as a cooking teacher, staying here perhaps a year, then taking a course at Columbia or Pratt, by which time she will be old enough to take a school.

Simple Kitchen Furnishing.

The Commission found that the old form of gas-stove burners placed around the room is discredited in this school, because as the girls have to work at home with a stove, table and sink, they ought to have the same here. As a big stove could not be got, four ordinary ones were placed together in the middle of the room, so that the girls step from the table to the stove and over to the sink. The fitting of these rooms cost only about $600, instead of $1,800 in the old style.

Principal Weaver's theory is that teaching a girl to make a loaf of bread and calling it a lesson does not work. She has to make it till she can do it like playing the piano while talking over her shoulder; you can't teach it like a lesson and then go on to the next. So in pickling—they have to handle a whole lot of stuff, and do it over and over, before they get the reaction. Many of the teachers who keep house buy bread made by the pupils, and the girls also buy it to take home. The pupils make bottled fruit and pickles. They have a pretty stiff course in this at the beginning of the season.

About $250 a month is spent in the 3 kitchens for milk, butter, eggs, etc., but this does not cost the city a cent, as the articles are sold at lunch. This school does not cater for the lunch—it is an educational by-product, and is sent down to the lunch counter and sold for enough to cover the cost of material and waste; thus the class costs only the instruction in the room, the same as a class in history. The girls in most of the classes in other schools cook little messes and eat them, no attempt being made to turn them into money. This problem has been solved here; the girls get good lunch cheaply, and the school gets the returns.

Each girl has a wooden covered box for apron, towels, work in hand, cook book, etc., the latter being printed to save time in copying.

Vocational Assistant.

The school keeps close tab on pupils through a woman called a vocational assistant, who looks up the shops and secures places for the girls, learns of their leaving or changing places or receiving increased wages, and deals with anything unsatisfactory. Teachers at the school find what the girls like, and the school has to keep up with the times in constantly changing business and shop methods.

This school covers pretty much the same work as the Trade School for Girls, only much more fully, as the latter takes a shorter time and pupils have not the preparation before they come in, being of a lower grade. The girls here must all be graduates of the grammar school, hence they get some cooking and sewing before coming here. Occasionally a girl is sent down to the Trade School when it is found that she needs to go to work and cannot stay the 4 years. Some girls drop out of this school before completion of full course, because of leaving the town or going to work, but not to go to another High School to any extent; and they don't drop out to do nothing, as in other High Schools.

SECTION 8: THE WASHINGTON IRVING HIGH SCHOOL FOR GIRLS, NEW YORK.

This School has five branches in various districts of New York City, the total number of pupils being 4,600, with 125 teachers and a head of each of the branch schools, the latter of whom do no teaching.

The courses include Commercial Work, Dressmaking, Millinery, Embroidery, a Special Course for Designers, as well as one for Bookbinders, Printers and Library Assistants.

In spite of the fact that the building visited by the Commission was decidedly overcrowded, the girls all seemed very happy, busy and alert, and of an exceptionally high physical type. This is ascribed in part to the excellent system of physical culture practised, which includes calisthenics, dancing and Swedish exercises. The girls are also given breathing and body movement exercises at the close of each period of school work. The spirit of the school was free and natural, unhampered by rigid disciplinary rules.

One-third of the students are taking purely academic courses, covering 4 years, and two-thirds the vocational courses plus academic, extending over 3 years.

The students in the Art Design class were executing some exceptionally fine original designs for embroideries and costume magazines, and were thoroughly well equipped to take charge of dressmaking and millinery establishments and other branches for which they were being trained. Scholarships are awarded which take the students to higher Art institutions. 100 students were taking a course in Design, some of whom go into trade and others enter higher Art schools.

Ladies' tailoring is not taught, being classified as a man's occupation.

There are over 1,000 students in the Commercial classes, with 15 teachers.

Breezy School Literature.

The jovial spirit of the school is reflected in the name by which it is known among the pupils—"The Washing and Ironing School"—and in the bright breezy "Composite letter" issued by the Girls' Welcome Committee of the school, embellished with many illustrations from drawings made by the girls in the Art department. After enumerating the many subjects that may be taken, the "letter" goes on:—

One girl does not study all these things at once. Oh, dear no, the studies are arranged in courses. You have to select your course when you enter. There is the four years' course and the three years' course. Let us tell you about them. The first-year work in each is not very different from the first year in the other, so that a girl may change without difficulty.

The Four Years' Course gives you a general academic education or prepares you for the teachers' training school, or for college. Nine hundred and eighty-two of us are taking this course. No high school in the city has shown a higher record than our graduates in the training schools.

We have a four years' course, too, for girls preparing to be Library Assistants. Their first two years of work are just the same as all the other four years girls, but in their last two years they practise cataloguing and managing parts of libraries.

Fifteen hundred and sixty-three of us are in the three years' course. One of these departments is that for Designers, comprising still-life, picture study, draperies, illustrating, lettering and design.

Another three years' course is that for Dressmakers. It has in it: sewing, draughting, costume design and millinery. The graduates from it get good paying positions immediately.

Our Commercial Course is also three years long and it includes stenography, typewriting' bookkeeping and various kinds of office work. So numerous have been the requests for our graduates that the school has not been able to supply the demand. Business houses do not want cheap girls turned out of short-course business schools. They call for well-trained young women who can spell, who are liberally educated, who can compose good letters, who know something more than the mere operation of a typewriting machine. Make no mistake about this. Don't let anyone fool you with a short-cut proposition that will fit you for a third-rate place from which you cannot rise. Start right and make yourself a high-grade, well-educated woman.

You ought to walk to and from school every day, rain or shine, to be sure of getting fresh air and exercise, so as to keep well and happy.

The social life of the school is rather remarkable, and the girls' view of it is given thus:—

Of course, you want to know about some of the interesting features of school life that have made the Washington Irving School a favourite with us.

We all believe school to be a social institution. A part of your training here will be in the management of such social gatherings as educated and able women are called upon to direct. We have given receptions to Mrs. Hughes, the wife of our Governor; to Mrs. McClellan, the wife of our Mayor; to Mrs. McGowan, the wife of the President of the Board of Aldermen; to Mrs. Winthrop, the wife of the President of the Board of Education; to the ladies of the Federation of Women's Clubs and to others prominent in the best interests of our time. It is a valuable experience to be hostesses to wide-awake women. Our committees on speakers bring to the school the men and women most active in the world's work. Our girls take charge of these meetings and learn to assume the responsibilities of social life.

Our teachers are glad to give to us the chief place in these affairs and to assist us by suggestion and advice. Our teachers do not build stone walls about themselves, but, like sisters, enter into our interests with encouragement and enthusiasm. This has made the Washington Irving known as a family school, with a delightful spirit of equality. We have no patience with school-girl snobbery. The first thing we do when a new term opens is to give a reception to the new girls, to make them feel their welcome.

You will be surprised to find how easy it is to take hold and help conduct the assembly exercises of the school without any teacher taking part in it at all. You will find the conversation classes on the topics of the day delightful.

So, too, will you enjoy the excursions to the art galleries, the museums, the stores and the woods, as well as the annual visit of your present teachers to our school, to meet you once more and to encourage you in your advancement. Every spring you will take part in Appreciation Day, a reception especially for your own particular friends.

Now, dear, we mustn't make this letter too long, but we must say again that you have a great opportunity. Talk it over with your father and mother. The success of your whole life depends upon what you make of yourself. Perhaps it is thought at home that you cannot go to school for four years longer. Why not try it for one year? Every week that you devote to a continuance of your education is a gain well worth the trouble.

You don't want to be apologizing all your life long. Be able to say you made the most of the opportunities the great city of New York offered you.

Yours cordially,

All the Girls of the Washington Irving High School.

SECTION 9: THE MARGARET MORRISON CARNEGIE SCHOOL, PITTSBURGH, PA.

Information obtained from "Conversation" with MISS CLARA L. WEST, *Principal.*

There are 475 pupils. This (1911) is the fifth year of the school, and its first in the present building.

The entrance requirement is High School graduation or an equivalent examination. Students may be examined for admission at 16 and over, but the usual age for admission is up to 18, although there are some women of 20, 30 and 40 who are doing special work.

During the first two years, general training is given. During this time the student is not allowed to begin her specialization, the aim being to develop her power, her ability. After that she chooses a special line. If she is not to be a teacher she may take her diploma at the end of 3 years; teachers must have 4 years of training.

Training Leaders and Home-Makers.

The aim is to train women as leaders and home-makers. The main service of the school is to make them home-makers, and then to develop such power that they may be efficient in social service and leadership. The school aims to unite college education, technical education and finishing education. It stands for the graces of life and the best features of stability, utility and beauty. The stability is represented by those tested academic studies which have stood the wear and tear of time. That is how the school has developed. A certain number of academic subjects are taught—a sufficient number to develop a woman on what are called college or intellectual lines—then a certain number of technical or manual things which will make her apply her brain knowledge to her hand; and then enough of those things which are necessary to the development of the graces of life—æsthetic dancing, carol singing, dramatics, glee club work, and a great deal in literature, the history of education, and psychology—things that are necessary on the side of æsthetics, ethics, the useful, the beautiful, the good.

We want Queen Anne in the front room and Mary Anne in the backroom equally efficient. The point is to balance these so that a woman shall be an efficient and professional woman in her own home, whether it be a single home or some institution through which she serves the community and the State.

Cultural, Technical and Finishing Courses.

This is a school for women trying to put together the cultural, technical and finishing courses. Ultimately this school will grant a degree. At one time there was a good deal of opposition on the part of the women because they considered the school was doing kitchen work, and they did not think that was college education. Miss West got all the college women together and said "You must take more of these things in the college curriculum. Your college curriculum is a curriculum made by men, and the reason you wanted it is because you wished to prove to men that you have as good brains as they have, and prove it on their lines. Now, having proved that, you may well afford to give it up and have a curriculum suited to your own lives and functions, and you have not got it now." This was the theory on which she based her plan as far as possible—that the world is held in shape by two apparently contending and opposing forces—the centrifugal and centripetal—the one flowing, progressive, investigating; the other conservative, tending to a centre of rest. They are equal forces; otherwise there would be chaos They are equal in force and in value, but different in function. They are united in purpose. Now, that is what should be considered in educating men and women; their united purpose is the elevation of humanity. They are different in function but united in purpose, and they are equal in value; that is very clear. Then why not educate a girl for her function, instead of making her a feeble imitation of a boy?

Unique Method of Teaching.

It is the method of teaching the subjects in which the school claims to be somewhat unique. Very few textbooks are used; principles are touched on, but textbooks are required as biographies, for reference, and for individual reading. The development of the individual is aimed at as much as possible, and this is done even in sewing, and often very successfully in things which one would think were not connected are correlated. The strength of the school has been in that one thing; that is where it has succeeded.

Miss West gave an illustration of correlation. While she was lecturing on the health of the child, preservation of health, and the elevation of the moral standard by the Greeks, the teacher was going over the Greek literature with the class. While teaching the moral law, she selects for illustration Antigone's defence, and reads the great passage from Socrates—her justification in burying her brother and appealing to the supreme law. The English Department at the same time is teaching sentence structure, but the reading may be a description of the Olympic games out of a Greek author. In the senior year the history has been taught in a certain way, and when dealing with Cicero and the philosophy of Latin civilization, Miss West begins with the play of Julius Caesar where he walks through the storm, just to illustrate by that one passage the idea that the storm is the symbol of the life which he lived in the political anarchy. The pupils have that one peg on which to hang an estimate of Cicero's value. Then they are shown not only Cicero's ethics of his time, but what we learn by looking back at him. They learn not to judge dreamers as the ancients judged him, and cut his head off, but as he has been judged later on as one of great value to the human race for what he did. He was an eclectic philosopher. For that reason we should learn not to judge our dreamers, because we don't know what the future is to unfold; their peculiarity may be necessary for the world. The girls have had all that preparation in reading Julius Caesar in the literature classes, and it comes that way. The same with history. The basis is all prepared in the classes. In addition, there are mathematics, science, ethics, history.

Blending of the Practical Cultural Social.

Students make more progress in these because they have much hand work. If a right balance of the cultural and academic subjects with the technical subjects can be attained, the education of woman will have been solved. The solution came in the Middle Ages with the great Guilds of Florence. The highest intellectual attainment was accompanied by the greatest skill of the hand; they could put it into use and turn it into beauty in life. The cultivation of the tastes is the greatest thing that can be done for women.

The authorities of this school look to the time when woman will get her rights, not as a voter particularly—for that is not the main thing—but her right to help in civic administration for health, sanitation, the conduct of schools, hygiene—in fact, the care of the child life of the world. The basis of the school's

work is really the care of the health of the world and the elevation of moral standards of society. Hence a girl may get this liberal education and go home and do nothing else; she is a well-educated woman who understands her obligations. Or she may understand her power so that at the end of her second year she develops in specialization as a dressmaker, costume designer, secretary, or in household arts or domestic science as dietician for hospitals or manager of institutions, or as a teacher of any of these things.

The students who are going to be teachers go to the settlement work and practise, and we have reports as to their ability to manage children and adapt themselves to the teaching. The school has arrangements with hospitals by which field work can be done by dieticians, and also for sewing, cooking and secretarial work in offices. Besides their work at school, students must have had field work and have worked it out in connection with life.

Domestic Science and Dietetics.

In Domestic Science the rooms are called kitchens, and the girls work on the exact quantities used in a family. The canning and preserving is always sold to the faculty and the money brought back to the school. In the Process Kitchen the first class learn baking, boiling, stewing and frying. They don't waste their time cleaning dishes; there are maids to prepare for the classes. A class in dietetics, computing the calories in foods, are training to be dieticians. The woman is kept in her normal position as a woman as much as possible. The rooms are a fair sample of conditions and work. Students work out in a theoretical way the day's diet on the basis of what the body needs; then in their estimate of the foods, they find in what proportions those things exist, and make up their dietaries. They discuss the influence of age, occupation, climate, etc., and adapt the diet to the particular individual.

They work on an economic basis by limiting the amount for foods, and seeing if it is possible to buy food for 15 and 25 cents a day, taking the average American man's working diet. They also work on school children's diet, especially with regard to their own earnings, going into the theory accurately and then taking it into the kitchen to see whether they can work it out.

Art in Color Line and Form.

In Art studies they have cotton print designs because they are going to choose cotton print dresses. They are first shown the combination of straight lines and spots, then how to make their repeat on square paper, either regular or angular or alternate repeat. The first two years has everything to do with the women in the home—not training them as artists, but training them in color and line arrangement above everything else.

Towards the end of the Junior year they have a very informal set of illustrated lectures, relating to those things together, as they meet them in their homes and dress; and this is correlated with the sewing department in the Junior year. Then in the Senior course they make designs and carry out the work of

every-day designs for the home. Then they have type problems—one each in stencil, metal, leather and pottery—the types of decoration they are going to use in their home; and one in that course is always reserved for a "fad" problem—the worst fad that can be found; the thing that is worst done in the country—embossed cards, or something like that to see how that can be handled adequately and well.

Then there is a special elective course in costume designing—a technical course to develop good taste and make technicians of them. Then comes the graduate course.

Trade Designing in Evening.

There is a night class for trade designing, where girls are trained to work in a limited field so that they can go into the various trades or make the actual article. The course goes on progressively and coherently for three years. In the garment costume work, dressmakers come for two hours a week for intimate adaptation, not creative work but adapting styles. They get facility of hand through studying the reasons why things are done. In the embroidery class they work designs on handkerchief corners and work out features in colors.

At the beginning of the English course the students have a short course in parliamentary procedure, learning to organize clubs and conduct a meeting. In the secretarial course they have commercial law in the third year. Economics are taught, then psychology, theory of teaching, practice observation. Science is correlated—physiology in the centre, chemistry on one side and dietetics on the other.

General Statement.

The building occupied by the Margaret Morrison Carnegie School is the first of a proposed group to be devoted to the education and training of women for the home and along specific technical and industrial lines.

Externally, its appearance differentiates it at once from the buildings designed for the Engineering and Trade Departments of the Technical Schools; and the ideals of the Woman's School are expressed in the motto on the cornice of the entrance court:—

> "To make and inspire the home;
> To lessen suffering and increase happiness;
> To aid mankind in its upward struggles;
> To enoble and adorn life's work, however humble—
> These are woman's high prerogatives."

The Margaret Morrison Carnegie School offers courses adapted to meet widely different needs. These are divided into the following heads:—

1. Day School,—
   - *a*. Regular Home Maker's Course of two years with Technical Specialization in the third year.
   - *b*. Graduate course for the Training of Teachers. Fourth year.
   - *c*. Special Subject Courses.
2. Night School,—
   - *a*. Courses for Home and Trade Use.

Although the work given under these heads varies to meet the requirements of the different courses and the needs of the students enrolled therein, the main aim and purpose of the School remains the same throughout all the courses, namely, the development of the individuality and womanliness of the student and the utilization of her powers in the broadest possible way along the lines of her keenest interest and greatest aptitude.

REGULAR DAY COURSE.

The 3-year regular day course embraces 2 years of general training, with special emphasis on home-making, followed by one year of technical vocational training. The aim of the first division of the course may briefly be stated under the three following heads:—

(*a*) To give the student a new point of view, as to her obligations and opportunities as a woman.

(*b*) To present to her new fields of thought and interest and to give her the opportunity to prove to herself and to the Faculty of the School her fitness to elect one of the lines of technical specialization offered in the Senior year.

(*c*) To develop powers of concentration, observation, and reasoning necessary to success in any field, and to give sound general training in the essentials of woman's education which will serve to prepare her as a home-maker in the highest sense of the word, and be a foundation for any of the lines of specialization.

The credits assigned to the Plebe and Junior years are as follows:—

History	7½	English	13½
Physiology	5	Ethics	1¾
Economics	2	Home Nursing	½
Hygiene	½	Chemistry	8½
Mathematics	3¾	Distribution of Income	1½
Accounts	1¼	Cooking	5
Dietetics	2¼	Housekeeping	1
Laundry	1	Physics	1
Textiles	½	Sewing	4
Drawing	4½	Physical Training	4
Food Mfg. and Production	1	Choral Singing	2
			72

Specialized Courses of the Senior Year.

The fields of specialization offered by the Day Technical School are those in which a woman's experience and a womanly point of view may be considered as very positive aids to success.

To students who have satisfactorily completed the work of the Plebe and Junior years and have secured credit standing in the subjects of those years, fundamental to their chosen line of specialization, technical work in the following courses is offered: (a) Household Arts Course: (b) Secretarial Course: (c) Dressmaking Course: (d) Costume Design Course.

HOUSEHOLD ARTS COURSE.

The object of this Course is to intensify the interest of women in the development of the home, the conservation of its proportion and individuality, the extension of its influence.

A broader view of the economic function of woman, either as producer or consumer, is aimed at. The means for extending this possibility by making her efficient in either capacity is provided for.

In raising household work to a professional level, the course has, as its base, efficient teaching in English, History, Ethics, Psychology, Design, Chemistry, Bacteriology, Home Economics, Sanitation, Household Management, Institutional Management, Practical Cooking, Dietaries—family and institutional portions.

Actual practice in the Housekeeping Apartment gives each student experience in every form of household training with an appreciation of methods of distribution, co-operation and rotation of work.

The institutional phase of the work offers opportunity for training of housekeepers, managers or dietitians for school lunch rooms, women's clubs and tea rooms. For a diploma in this course a student must obtain credit standing throughout the year on the following subjects:

Chemistry	4	English	2
Bacteriology	2	History	2
Institutional Management	6	Social Ethics	1
Housekeeping	6	Physical Training	1
Dietaries	9	Choral Singing	1
Applied Design for the Household	2		36

COSTUME ILLUSTRATION AND DESIGN COURSE.

This course offers an opportunity for young women of originality and artistic ability to make use of these talents in practical ways, as designers of original costumes, illustrators of costumes for fashion magazines and millinery plates, or as cataloguers of costumes for importing and dress-making establishments.

The specialized work of the course includes Drawing and theory of Color, Design, Pose Drawing, History of Costume, Costume Design and Illustration, and Pattern Modeling.

To be recommended by the faculty for a diploma in this course, the student must obtain credit in the following subjects:

Costume Illustration and Design	10	Millinery	2
Pose Drawing	8	English	2
Drawing	5½	History	2
History of Costume	1½	Social Ethics	1
Pattern Modeling	2	Physical Training	1
		Choral Singing	1
			36

NIGHT SCHOOL.

The Night School is primarily for students who are employed during the day, and its work necessarily differs from that offered by the Day School because of the brief period of time that students can give to school work and to outside study. The sessions are held from 7:30 to 9:30 p.m. on Monday, Wednesday, and Friday evenings.

The minimum age for admission is 17.

Preference is given applicants employed during the day and dependent upon their earnings for their livelihood. There are no written tests for entrance, but each applicant must, in a personal interview, satisfy the Interviewing Officer of her fitness to profitably pursue the work of the School. Special requirements for admission to the different departments are stated under the description of the course offered. Capacity, earnestness, and *regularity in attendance* are essentials to the retention of a place in the classes.

The School does not attempt to develop experts, but to those who are gaining their livelihood by daily employment offers courses of instruction that will increase their efficiency and hence their earning power.

The system of instruction is especially helpful to those who have not had an opportunity to acquire the theoretical foundation and breadth of training necessary for intelligent practical operation. When this broader training is combined with actual practice in all branches of the subjects taught, it should enable the students to advance along their chosen lines more rapidly and efficiently, and finally qualify them to fill higher positions than would otherwise be open to them.

The Night School Certificate is awarded to all students who complete, to the satisfaction of the faculty, any one of the Regular Courses offered in the Night School.

No certificate is granted to a student unsatisfactory in her attendance.

CHAPTER LXIX: CORRESPONDENCE STUDY SCHOOLS.

In addition to the information submitted hereafter in this chapter, attention is called to what is said on Correspondence-Study Courses in section 8 of chapter VI of part II of the Report, at pages 219 to 224. The Correspondence-Study Courses of the University of Wisconsin are outlined there with a sufficient measure of fulness.

SECTION 1: PRINTING COURSE OF THE INTERNATIONAL TYPOGRAPHICAL UNION.

Under the direction of the Commission on Supplemental Education of the International Typographical Union, the *Inland Printer* Technical School conducts a course in printing.

In 1907 at the Hot Springs Convention this Commission was appointed to formulate some system for the technical education of the members and apprentices of the Union. At that time the *Inland Printer* School, Chicago, had been for six or seven years conducting the most successful institution of its kind under the encouragement of the Union, and a suggestion was made that it would be possible to put the course, given at this school, in writing so as to permit it to be given through a correspondence course.

Comprehensive Course Needed.

The International Typographical Union being composed of more than 60,000 printers scattered over the continent, and working in small as well as in the most pretentious offices, it was necessary that the Commission adopt or devise a system of education that would reach and prove beneficial to the most expert in the metropolitan office as well as the most inexperienced working in an out-of-the-way town with a few hundred inhabitants and one printing-office.

As it was not "making printers," the Commission discovered it would be quite feasible to impart principles by correspondence, thereby giving the student an opportunity to learn much that ought to be taught during an apprenticeship, as well as what cannot be acquired in a printing office, but which is needful to a thorough understanding of type composition.

The Commission also assured itself that a course such as would be derived from the instruction given in the *Inland Printer* Technical School would enable the dependent compositor to branch out and do work that is rapidly falling into the hands of commercial designers and other graduates of art schools, but which logically, economically and industrially is within the province of the compositor. Satisfied that such a course at once would widen the field of the compositor's operations and enable apprentices and indifferent printers to obtain a better grasp on the fundamental principles of typography, the Commission decided to adopt the correspondence course.

Low-Priced but Effective.

From the standpoint of the International Typographical Union it is necessary that this instruction be imparted at as low a price as possible—free from the taint of profit—for the sole object of the plan is the advancement of the student. The *Inland Printer* School management declared its willingness to co-operate with the Union in any method that gave promise of widespread dissemination and be satisfied with the prestige that accrued from being connected with such an uplift movement. At the time it was estimated $20 would about cover the cost of outfit, postage, tuition, etc., and that figure was agreed upon as the price at which the scholarships should be sold. The International Typographical Union on its part agreed to defray all expenses incidental to advertising the course, and in addition give a rebate, or prize, of $5 to every student who pursues the lessons to their end with ordinary diligence and intelligence.

This arrangement made possible the selling of an educational course at the sum named, which as a commercial venture would cost $50 or $60, perhaps more. The unusual method of reward was adopted in preference to that of giving large prizes to exceptionally adept students, because the Union desired to stimulate thought on technical matters connected with the craft, certain that in doing so it would widen the workfield for compositors.

Lessons Relate to Actual Work.

So anxious is it to give him the best possible information, that the Commission asks each student to keep a pad beside him and jot down anything which seems to interfere with his work, initialing it and sending it to headquarters, where it receives the earnest attention of the instruction department. A detail of the method employed is interesting. The student sends in his lesson, be it one on lettering, design or a piece of type composition. The instructor takes it up, goes over it carefully, letter for letter or line for line, as the case may require, marking such defects as are apparent and showing where and how to improve, all the while talking into a phonograph recorder, giving his reasons for the alterations and criticisms and advising the student. The phonograph record is transcribed on a typewriter and the typewritten letter of advice and criticism, together with the marked lesson sheet, are mailed to the student. By this means the latter gets the benefit of a blackboard illustration and oral instruction at the same time.

High-Class Criticism and Advice.

The great value of the I.T.U. Course lies not in the printed lessons, but in the criticism and advice which flow in a steady stream from the instruction department, couched in language familiar to the printer-student. It may be that other correspondence courses do not concern themselves so much about details of this kind, but the Commission maintains that in these details lies the chief value of the course. The students learn by doing, and doing correctly, under the eye of capable and painstaking tutors. Being shown *why* his work is wrong, and how to correct it, is of inestimable value to a student.

SECTION 2: THE INTERNATIONAL CORRESPONDENCE SCHOOL, SCRANTON, PA.

This institution started about 22 years ago, and has enrolled over a million and a half of students of all kinds, conditions and classes and at all stages of preparation. The postage is $525 a day and there are 1500 employees. Students on taking up the course are brimful of enthusiasm, but after a few lessons the majority drop the work. However, many of them subsequently resume their studies, even after an interval of 10 or 12 years, and often complete the course eventually. The School has never yet held up a student who desired to complete the course, although the contract calls for its completion within 5 years. The educational power in the school is vested entirely in the staff; an executive committee elected by the Board of Directors conduct the business from a practical standpoint—that is attend to the book-keeping and administration.

How Difficulties Are Met.

The text-books, examination papers, etc., used by the school have all been compiled by experts and constantly revised until all difficulties likely to be met with by a student have been eliminated. On being returned by the student each paper is examined by two Examiners, (the one checking the work of the other), and then submitted, in many cases, to a specialist before the corrected papers are sent back to the student. Each lesson is based on the previous one sent in by the student. It is not a stock letter, but is specially dictated for each particular student. The courses are checked by practical men so as to ensure their being up-to-date in every particular. As for instance, when the Electrical Drawing Courses were revised, the men that went over them were the heads of the General Electric Company and of the Westinghouse Company.

Encouragement of Students.

A special department of the institution is that devoted to the encouragement of students to keep on with their studies. One of the greatest difficulties met with was that of keeping students at work. Quite a number feel the moment they get the first instruction papers that the task is greater than they can undertake. When no reply is obtained from a student for a week he is written to,and after another week he is written to again, and so on four times. Then if he still does not reply a notice is sent to the representative in his neighbourhood and an attempt is made to encourage him to persevere with his task. Every time a student misses to send in the answers to his papers, within the average time, this course is followed.

Courses Covered.

The school gives courses of instruction in all branches of the following subjects:—

Advertising
Agriculture
Architecture
Arts and Craft
Automobile Running
Boilermakers
Chemistry
Civil Engineering
Commerce
Concrete Engineering
Electrical Engineering
English Branches
Gas-Engine Operating
Languages
Law, Commercial
Lettering and Sign Painting
Locomotive Running
Mechanical Drawing
Mechanical Engineering
Mines (Coal and Metal)
Navigation
Pedagogy
Plumbing, Heating and Ventilation
Poultry Husbandry
Salesmanship
Sheet-Metal Work, Boilermaking
Show-Card Writing
Special Courses
Steam Engineering
Structural Engineering
Textiles
Window Trim'g & Merc'tile Decoration.

Co-operation With Railways.

As illustrating the working methods of the school it might be mentioned that contracts have been entered into with about 170 railways, who agree with the school to collect payments from men who accept courses of instruction. Cars are equipped with models of airbrake apparatus in working order and these are sent over the road and all the employees of that road are entitled to instruction. Then the school has instructors at different points, who remove about half the seats from a passenger car and put in tables for the use of employees who attend lectures and demonstrations. The work taken up is principally the study of air brakes, general mechanics, train orders, and all that pertains to transportation. All railway men have to pass examinations, both before being taken on and for subsequent promotion to the rank of engineer, etc., and the work of the instructors is to fit the men to pass those examinations.

CHAPTER LXX: LEGISLATION FOR INDUSTRIAL EDUCATION.

"The year 1910-11 has witnessed a substantial advance in legislative and other practical measures looking to the development of industrial education in the United States. In Massachusetts, which has taken the lead in State activity in this field, important steps were taken during the year. Perhaps first among these was the passage of a new act by the legislature which has materially altered the conditions under which the State support may be obtained by industrial schools. By the terms of the original act of 1906, amended in 1909, a community could obtain the assistance of the State toward the maintenance of industrial schools only by constituting an independent Board of Trustees to manage such schools. By the new act industrial schools may hereafter be established under the local school board, which has entire freedom to control such schools, provided they bear the burden of support. Such schools, however, may obtain the benefit of the State's aid and remain under the direction of the local board if they conform to the standards set up by the State Board of Education and are approved by that body.

"Another important legislative action during the year was the passage of a resolve appropriating $7,000 for an investigation into the possibilities of part-time instruction for the State of Massachusetts. This investigation was placed in the hands of the State Board of Education.

"In January, 1911, the State Board of Education issued a report upon the problem of agricultural education in Massachusetts. The constructive feature of this report was a recommendation that part-time schools be established in which the pupil should devote a portion of his time to systematic work and tabulation of results upon a part of the home farm, leaving the school instruction to deal with the scientific principles involved, agricultural methods, and a study of the student's experimental results.

"One of the incidental but valuable features of the report was a series of definitions as to the terminology of vocational education with a view toward an exact interpretation of such terms when used in cities of Massachusetts and in rulings of the State Board of Education. Of still further value in this direction is a bulletin published by the State Board in September, 1911, defining in exact terms the standards as to school organization, courses of study, and methods of instruction necessary to secure the approval of proposed schools by the Board and the award of State moneys."

New York State.

In New York State the education law has been revised during the past year and the law relating to industrial and trade schools passed in 1908 has had

a section added which concerns 'schools of agriculture, mechanic arts, and home making,' open to pupils who have completed the elementary school course or who have attained the age of 14 or have met such other requirements as local school authorities may have prescribed.

Syllabi have been developed by the State education department for use in intermediate industrial schools covering the subjects of industrial and commercial geography, industrial arithmetic, mechanical drawing, and home making. Syllabi in farm mechanics, dairying, animal husbandry, farm crops, etc , have also been developed for the agricultural schools.

There are at present 35 industrial and trade schools in the State, employing 145 teachers, with a day enrollment of 3,370 pupils and an evening enrollment of 2,933 pupils.

The State has definitely undertaken to train teachers for vocational work. Recognizing the fact that no one type of school is competent to deal with the problem, this work is being carried on in three State normal schools. One of these institutions has an evening training school for mechanics who are fitting themselves as teachers. The emphasis in these teachers' courses is placed upon the planning of courses of work and equipment; upon instruction in shop mathematics, electricity, and mechanics; and finally, upon methods of teaching industrial subjects. One of the normal schools has a course in training teachers of agriculture. The work of this school is not intended to rival that of the agricultural colleges, but to prepare teachers to carry on any of the scientific work related to agriculture outlined in the syllabus of the department.

Wisconsin Commission on Industrial and Agricultural Extension.

The Commission which was appointed by the Legislature of the State of Wisconsin in the year 1909 to investigate the subject of Industrial and Agricultural instruction and formulate plans on which to base legislative action, submitted its report to the Governor on January 10, 1911.

The Commission urgently recommends continuation schools with compulsory attendance of children from 14 to 16 years of age already engaged in industry, supplemented by Trade and Evening Schools. It urges the limitation of children's labor to eight hours, including all time occupied in vocational schools, and advises the modernization and extension of outgrown apprenticeship laws and their adaptation to the requirements of proposed industrial schools.

In regard to rural schools, the Commission advises the establishment of a central Board of Education, elected at large for each county, this Board to engage a county superintendent and to consolidate school districts and to discontinue schools at will. State aid is recommended for consolidated schools, provided agriculture or agricultural and domestic sciences are introduced, and courses of study and teachers shall be subject to the approval of the State Superintendent. Additional State aid is recommended for State graded schools, village and city schools, and township High Schools, with the same provisions specified for rural schools.

The Commission further proposed that each County Agricultural School shall receive from the State $6,000 per annum instead of the present sum of

$4,000, provided that the county contribute not less than the State if the State contributes more than $4,000.

In order to illustrate how continuation schools may be adapted to the requirements of the State—in villages as well as in cities—the Commission presents an elaborate survey of the field of German industrial education. The tendency of industrial schools to become theoretical instead of practical, and the manner of obviating the difficulty are emphasized. The report says:

"After a long period of trial the Germans have established almost universally local committees of business men, manufacturers and workmen, who control these schools wherever they are. * * * * *

We believe that the State of Wisconsin instead of relying upon the establishment of trade schools such as have been set up in the thickly populated State of Massachusetts, should begin at once a plan for providing for this period between 14 and 16 years of age by means of continuation schools. In that way we can reach the greatest number at the least cost and we can allow the system to grow gradually and with the best results. It is the general agreement of all investigators * * * * * that boys are not generally wanted as apprentices before they are 16 years of age. Therefore if they leave school at 14 they practically waste their time."

The recommendations regarding industrial education depend for their effectiveness upon the State University, which is relied upon to fill the gaps in the system and render it sufficiently elastic to meet local requirements without bringing too heavy burdens upon the poorer communities.

In regard to the training of teachers in industrial and agricultural schools, the report recommends:—

That a minimum salary law be passed which shall apply to all teachers in industrial and agricultural subjects, and which, while placing emphasis upon thoroughgoing general training, shall place an additional premium upon special preparation for the teaching of agricultural and industrial subjects.

That adequate provision be made in some State institution of normal school grade and in the county training schools for the establishment of courses of instruction in industrial and agricultural education and the extension of courses already in existence of a character that will give proper emphasis to industrial and agricultural training.

That the High Schools in the State other than the free High Schools, commonly known as the independent High Schools, shall receive State aid for manual training, agriculture and domestic economy to the same extent that State aid is granted to free High Schools for these purposes.

"As a result of this report the Legislature of Wisconsin passed a number of Acts which became laws May 19th of the current year (1911). These laws provide that when any school board shall decide to establish a trade school or schools, a tax not exceeding three-tenths of a mill upon the dollar shall be levied upon the total assessed value of property in the city and used for the establishment and maintenance of the trade school; that the apprenticeship laws of the State shall be amended so as to prescribe that every apprentice shall receive instruction not less than five hours per week in English, in citizenship,

business practice, physiology, hygiene, the use of safety devices, and such other branches as may be approved by the State Board of Industrial Education, and that such instruction may be given in the public school; that whenever any evening school, continuation class, industrial school or course shall be established for minors between the ages of 14 and 16 working under the local board, every such child shall attend such school not less than five nours a week for six months in each year, and every employer shall allow all minor employees over 14 and under 16 years of age a corresponding reduction in hours of work; that employers shall allow a reduction of hours of work at the time when the classes are held whenever the working time and that of the class coincide; that illiterate minors shall attend public evening or continuation schools; that no State aid shall be granted to any school for instruction in agriculture, domestic economy, manual training or industrial branches unless the salary paid to every teacher instructing in such subjects be at least $60 per month; that a State Board of Industrial Education be created, to consist of three designated educators, *ex officio*, and six appointed members of whom three shall be employers of labor and three shall be skilled employees, and that this Board shall have control over all State aid given under the Act; that the State Superintendent of public instruction shall appoint an assistant in the department of instruction to be known as Assistant for Industrial Education; that in every town or village or city of over 5,000 inhabitants, there shall be, and in towns, cities and villages of less than 5,000 inhabitants there may be a local Board of Industrial Education whose duty it shall be to foster and establish and maintain, industrial, commercial continuation and evening schools, and that such a Board shall consist of the Superintendent of Schools and four other members, two employers and two employees who shall be appointed by the local board charged with the supervision of the schools and who shall serve without pay; that no State aid shall be granted to any school under this Act without the approval of the local Board of Education, and that no money that shall be appropriated by the city, town or village for these schools shall be spent without the approval of the local Board of Education; that whenever 25 persons qualified to attend an industrial commercial, continuation, or evening school file a petition therefor with the local Board of Education, the board shall establish such school or schools or provide other facilities, as authorized in this Act."

"These legal measures represent the most pronounced recognition of the part time continuation schools that has yet entered into legislative enactment. It goes without saying that progress made by Wisconsin in developing this particular type of industrial education will be watched with great interest by the rest of the country."

GROUPS OF SCHOOLS OF FOUR KINDS.

CHAPTER LXXI: TECHNICAL SCHOOLS FOR MINERS.

It has been already mentioned elsewhere in this Report that the Commission had the advantage of being accompanied during part of its enquiries in Europe by Professor Frederic H. Sexton, Director of Technical Education and Principal of the Nova Scotia Technical College. Professor Sexton, in company with the members of the Commission and also by himself, paid special attention to the Provisions for the Education of Miners. He made a full report on these matters as published in the annual report of the Superintendent of Education for Nova Scotia, 1911.

The portion of his report on Technical Schools for Miners, which extends to 65 pages, contains in a well arranged form substantially the information gathered by the Commission by visits to the schools described, supplemented by Professor Sexton's own enquiries and investigations. The Commission, with his consent, avails itself of the arrangement of the material from official sources as prepared by him for the schools of England and Germany.

Selections have been made of those parts which deal with classes and courses for working miners and foremen chiefly. No attempt is made to present a statement of work at such institutions of the highest grade as the Imperial College of Science and Technology at London and the Mining Academy at Freiberg, Germany, which also were visited.

In the Courses of Studies in Mining Schools stress is laid on Mathematics and Drawing and organized knowledge of the principles and practices in mining operations. A few paragraphs are given under "Courses of Study at Leeds" to indicate the importance attached to these subjects. A similar course is followed in regard to the Drawing in the report of the Glasgow and West of Scotland Technical College; and likewise, for organized knowledge of mining processes and operations under the report on the Mining School at Cowdenbeath. It is not without significance that at Aachen, Germany, the mining students receive instruction in singing, particularly mining and patriotic songs.

In this Chapter the Commission makes no particular recommendations, as it considers that the Provisions recommended in Chapter VII. of Part II. of the Report, pages 239 to 271, can be applied locally to the needs of miners as well as to those of other industrial workers. The arrangement of courses, and their content of subject matter, in the reports of the various schools which follow hereafter are suggestive and instructive.

SESSIONAL PAPER No. 191d

SECTION 1: ENGLAND.

In England the various Colleges in or near coal mining districts usually give three year Courses in Coal and Metal Mining leading to a degree of B.Sc. in these subjects.

Also throughout England, wherever colleries exist, there have been established technical schools in the shape of evening Continuation Classes or "part-time" day classes for the instruction of the men employed in the industry in the science and practice of mining. It is very common to find evening schools in every colliery town in a certain district with a carefully prepared Course covering two or three years and the higher courses offered under the auspices of some Technical College or University on one afternoon a week for 6 or 8 months of the year covering 3 years. In some of the colliery counties the general supervision and inspection is relegated to the professors in charge of the mining department of a centrally located University.

A few examples of the manner in which mining districts have been organized for technical education in mining subjects are given.

(1) LEEDS AND SHEFFIELD DISTRICTS.

The Leeds district and the Sheffield district cover most of the important colliery towns where classes in coal mining are held in Yorkshire. The Leeds district is taken as an example because it is one of the most highly and carefully organized centres in England.

The County Council's first year Mining Course was given at 25 centres in the Leeds district; and more advanced Courses, up to fourth year, at some of these centres.

The regular course is supposed to occupy five years, the first two years in general work in mathematics, science and drawing, and the last three years chiefly on the subject of Coal Mining. Most of the work in the last three years is done at Leeds University. For those who have not had good training in the public schools the Preparatory Course is offered, thus making the whole Coal Mining Course for these backward students cover a period of six years.

The County Council makes grants to Leeds and Sheffield Universities, in return for which, free places are provided in their courses, external lecture courses are given, and local mining classes are supervised and examined. Twenty exhibitions are awarded tenable at the above Universities. Special classes are held at the Universities for teachers on Saturday afternoons, all classes being held in the evening or on Saturdays. There are in addition to the classes enumerated above, numerous evening preparatory classes.

Courses of Study at Leeds.

GENERAL PREPARATORY COURSE.

(Taken in Grade I Schools.)

The Preparatory Course is organized to give a thorough grounding in English, Mathematics, Freehand and Instrumental Drawing, Wood-work, Metal-work.

The Preparatory Course is intended for those students whose elementary education is defective. The subjects of the course are therefore for the most part the same as those which are taken in elementary day schools. Much attention is paid to English Composition, the art of quick, accurate, and concise expression being of the utmost importance to students of technical subjects.

The Mathematics are largely confined to Workshop Arithmetic, but Instrumental Drawing and Geometry are combined with them, and the Course is arranged so as to be of direct practical benefit to artisans. Freehand and Model Drawing are also taken, and the work in these subjects is closely correlated with the instruction in Manual Work.

The Manual subjects taken include Wood-work. The lessons deal with the use of the commoner tools and with the character of the materials used; neat and accurate workmanship is required throughout.

FIRST AND SECOND YEARS.

(Taken in the Branch Artisan Schools.)

First Year,—	Hours per week.
Experimental Mathematics, Practical Mathematics, Practical Plane and Solid Geometry, and Hand Sketching	4
English	2

Second Year,—	
Experimental Mathematics (as above)	3
Mechanical Laboratory	2
English	1

After the first and second years, taken at the Branch Artisans' Schools, three years of more advanced work is done, most of which is provided for at Leeds University. Since special attention at the beginning of the course is drawn to the importance of Mathematics, the following paragraphs regarding that subject are presented:—

Re MATHEMATICS.

No student can possibly make any progress in Technical Education without a sound knowledge of the various branches of Elementary Mathematics, and as this subject is one in which students often experience great difficulties, the Education Committee has made special arrangements for teaching the subject in a new and thoroughly practical manner.

The term Experimental Mathematics is used to denote a course of instruction in which "Practical Mathematics," "Practical Plane and Solid Geometry," "Practical Mensuration," and "Hand-Sketching" are taught not separately but as one subject. As far as possible each fundamental principle of Mathematics is first dealt with arithmetically, then algebraically, and then geometrically. The calculations and drawings which are made by the students are for the most part based on their own observations and measurements of simple geometrical models, and of common objects and materials which are used or produced in the chief industries of the neighborhood.

* * * * * * * * *

In the first, second and third years, it will often be found desirable to devote one hour per week wholly to the hand-sketching of machine and building details, and of other materials which are used or produced in the more important local industries.

In the third and higher years separate classes for each trade, or branch of a trade, should, if possible, be provided, and the syllabus should be varied to suit the requirements of the different categories of students who are in attendance at the school.

THREE YEARS' COAL MINING COURSE.

This course is intended for miners and sub-officials who are occupied in or about collieries, and can only attend for one afternoon per week, but desire to qualify themselves for Managers' Certificates under the C. M. R. Act, and particularly for those who have attended complete courses of instruction in Mining at one of the local centres appointed by the West Riding County Council, or have attended the preparatory evening courses of the Leeds City Education Committee.

The course extends over three years. The first and third year students attend on Mondays from 3 to 7 p.m., the second year students on Tuesdays, during the same hours. The instruction in Engineering, Electrical Engineering and Geology is given in the respective departments, the remaining subjects in the Mining Department. In the class on Mathematics the subject is dealt with entirely from the mining point of view, the examples being taken from mining practice. Students are given mining data in the examples set, and are required to copy these out into an indexed pocketbook to form a nucleus for the observations which they subsequently make as a result of their own experience. A similar mode of treatment is adopted for the Chemistry

course, the properties of matter and chemical change being illustrated as far as possible from ordinary examples to be met with at a coal mine. In addition to the course of Surveying Drawing, a course of practical work in the use of surveying instruments is given during the third term. Lectures are given in connection with the two Surveying courses as they become necessary to explain the work in hand.

SYLLABUS.

First Year.	*Second Year.*	*Third Year.*
Mathematics.	Mining.	Mining.
Engineering.	Chemistry of Coal Mining.	Electricity.
Engineering Laboratory.	Surveying.	Electrical Engineering.
Mining.	Geology.	Laboratory.

The courses extend from the beginning of October to the end of April with a Christmas and Easter Recess.

(2) DURHAM DISTRICT.

In Durham the organization resembles that of other coal mining inspectorate districts.

Evening classes are offered at thirty-two centres, at which instruction is given in preparatory work and in the principles of mining. Instruction is given in various subjects at twenty-seven other centres. Scholarships are awarded good for Courses in Armstrong College, Newcastle-upon-Tyne; also travelling scholarships and students' transfers; forty scholarships, three years' Saturday afternoon course for miners.

The minimum of the hours of instruction as required by the Department of Higher Education of the County Council of Durham is outlined below. The years I and II may be taken in most of the local evening Continuation Classes for miners, some of the Courses—III, IV, V, and VI, are given in some colliery centres. The three years' Saturday afternoon classes at Armstrong College cover years IV, V and VI.

A syllabus of the Course is appended.

Year.	PREPARATORY COURSE.	Minimum hrs. per week per subject.
I.	Practical or Commercial Arithmetic for the average student	2
	English	1
	Object Drawing and Elementary Geometry	1
II.	Practical Mathematics	1
	Hand-sketching and Practical Geometry	1
	Elementary Mechanics and Physics (Theoretical and Practical) and English	1½

The other 30 minutes must be given either to Mechanics and Physics, or to Hand-sketching and Practical Geometry.

Year.	Mining Course.	Minimum hrs. per week per subject.
III.	Mensuration for Miners	1
	Mining and Geology	1
	Chemistry and Mechanics for Miners	1
	(Connects here with Armstrong College Saturday afternoon class).	
IV.	Mining and Geology	1
	Mine Surveying (Preliminary)	1
	Magnetism and Electricity	1
V.	Mining III, and Geology	1
	Mine Surveying (Ordinary)	1
	Preliminary Electrical Engineering	1
	In South Kensington.	
VI.	Honors Mining and Mine Manager's Certificate	1
	Surveying (Honors)	1
	Electrical Engineering (Ordinary)	1

THREE YEARS' SATURDAY AFTERNOON COURSE FOR MINERS AT ARMSTRONG COLLEGE, NEWCASTLE-UPON-TYNE.

1. The course extends over three winter sessions, each involving attendance for about 24 Saturday afternoons, from 3 to 6 p. m. Students may enter in any year of the course, each series of lectures being, as far as possible, entirely independent of the others and constituting a complete course in its own subjects.

2. The syllabus has been drawn up with the object of providing systematic courses of instruction for the benefit of those desirous of obtaining a careful training in the elements of the sciences upon which the art of mining is based.

3. The courses cover the whole of the theoretical requirements of the Colliery Manager's Certificate, and especially meet the case of industrial students elected to Evening Scholarships by the County Education Committee. 40 Scholarships, including renewals for a second or third session, have been reserved for the session 1911-12. These scholarships cover travelling expenses and fees.

4. Examinations in the respective subjects are held at the end of each course.

5. Students must be over 17 years of age, and must be *bona fide* working miners or mechanics or men earning their living by actual manual labor and should possess a preliminary knowledge of some of the science subjects dealt with in the course, such as may be acquired by attendance at an Evening Continuation School, and especially of Arithmetic, Algebra, and Mensuration, as follows:— (a) Arithmetic: the ordinary rules of arithmetic, including proportion, vulgar and decimal fractions. (b) Algebra up to and including simple equations, square and cube roots, and knowledge of powers of numbers, such as x^3 or x^4;

the use of logarithmic tables. (c) Mensuration: areas of triangles and rectangles; areas and circumferences of circles; surfaces of cylinders; volumes of cylinders and prisms. Students should possess a 1st Class Certificate of the Board of Education in the Second Stage of the Principles of Mining or hold what at the discretion of the County Education Committee may be considered an equivalent qualification.

6. Certificates will be granted to those students who attend satisfactorily and pass the examinations throughout the 3 years' course, and prizes will be awarded annually to the two students who do best in the aggregate examinations of the year.

7. The Board of Examinations for Colliery Managers' Certificates have agreed, by special resolution, to permit students holding college certificates, gained in connection with this course, to present such certificates along with their usual testimonials.

8. The following is a brief syllabus of the course of lectures for the session 1911-12.

The lectures are given between 3 and 6 p.m. The following is a list for those of the first year:—Geometry, 3 to 3.50 p.m.; Transmission of Power, 4.5 to 4.55 p.m.; Pumping and Ventilation, 5.10 to 6.00 p.m.

During the next term of the first year the subjects are: Elementary Trigonometry, 3.00 to 3.50 p.m.; Mine Surveying, 4.5 to 4.55 p.m.; Management of Horses, 5.10 to 6.00 p.m.

As an illustration of the matters treated of in the course of lectures, the subjects dealt with in Pumping and Ventilation are cited as follows:—

PUMPING AND VENTILATION—5.10 p.m. to 6 p.m.

Elementary notions of drainage, dams, reservoirs; syphons; baling; arrangement of pumps, driving, starting and working pumps; pipes; bucket pumps; plunger pumps; details, balance bobs, angle bobs, spears, catches, etc.; pump valves; direct acting pumps; electric, pneumatic and hydraulic pumps.

Principles of ventilation; movement of air currents; measurements of air-currents, anemometers, water gauges; natural ventilation; ventilating appliances, fans, furnaces; distribution of air-currents, splitting-currents, doors, stoppings, regulators; general considerations affecting ventilation.

The following courses will be delivered in the next two years to complete the three years' series:—

Machine Drawing,
The Chemistry of Fuel,
Boring and Shaft Sinking,
The Principles of Geology,
Experimental Mechanics,
Drifts and Levels,
The Steam Engine,
Theoretical Electricity,
Exploitation of Mines,
The Geology of the Coalfields,
The Chemistry of Mine Gases and Explosives.
Haulage and Winding.

SECTION 2: SCOTLAND.

The whole of Scotland is under one Mine Inspector, but educationally the two centres of Glasgow and Edinburgh control the Technical Education for coal miners in Scotland. The organization of the Continuation Schools for miners is much the same as in the colliery districts of England, but presents some distinct differences. The evening school work is affiliated with either the Glasgow Technical College in Glasgow or the Heriot-Watt College in Edinburgh. At Cowdenbeath in the County of Fife is a splendid local Technical School for coal miners which will be mentioned later.

County Continuation Schools for coal miners are provided at centres in three of the counties which are affiliated with the Glasgow Technical College. In Lanarkshire the classes are held at 19 centres; in Ayrshire the classes are held at 15 centres, including the sub-centres where the more elementary work only is provided for. In Dumbartonshire there are no classes conducted by the County Council Education Committee but the students are assisted to attend the Glasgow Technical College and other Central Institutions.

(1) GLASGOW AND WEST OF SCOTLAND TECHNICAL COLLEGE.

Preparatory courses are held three nights per week from 7.30 to 9.30. These are followed by three year courses which provide for Mathematics, Drawing, Coal Mining, General Science, Machinery, Mine Surveying, Mining Engineering, and Electrical Engineering as applied to Mining. As a great deal of attention is paid to Mathematics and Drawing, the following paragraphs are cited from the courses for the first year:—

COURSE 1. (FIRST YEAR) MATHEMATICS.

ARITHMETIC.—Vulgar and decimal fractions; their meaning and application for practical purposes. Percentages. Averages. The use of decimals; the fallacy of retaining more figures than are justifiable. Contracted methods of multiplying and dividing numbers, omitting all unnecessary figures. Exercises in areas, weights, and volumes. Mental arithmetic. Calculation of numerical values from simple formulae. Extraction of square roots.

ALGEBRA.—Meaning and use of algebraic symbols. Addition, subtraction, multiplication, division. Use of brackets. Substitution of numerical values for letters in formulae. Easy fractions. Factors. Easy equations of the first degree in one unknown. The plotting of points, and the construction of simple graphs on squared paper, with application to the solution of simple simultaneous equations of the first degree.

MENSURATION.—The simple properties of a triangle, parallelogram, and circle. Simple plane, and solid figures—rectangles, triangles, circle, cube, prism, and cylinder. Exercises have special reference to the various occupations of the students attending the class.

GEOMETRY.—Forms of simple solids; straight lines and angles. Symmetry of figures. Isosceles triangles. Construction of triangles with even parts. Parallel straight lines; sum of angles on a triangle. Problems of construction; Euclid, I, 47, by measurement and calculation, etc.

Stress will be laid on drawing to scale.

All drawing work should be to a large scale to obtain reasonably accurate results.

The pupil should have the following instruments:—A pair of dividers, a pair of compasses, a protractor, two set squares, and an accurate scale graduated in inches and tenths of an inch, and in centimeters and millimeters.

DRAWING IN GEOMETRY.

Geometry is an integral part of all the Drawing Classes, and is interwoven, throughout the session, with the technical drawing so as to produce a systematic and progressive course.

The examples in the solid work will, in the first instance, be demonstrated by the use of the paper models made by the students, and then exemplified and extended by exercises chosen, where possible, from the technical models or from actual practice.

Instruments—testing accuracy of set squares—different methods of dividing a line—construction of scales.

Explanation of the three co-ordinate planes, with illustrations by means of paper models. Points—plans and elevations on the three co-ordinate planes; example—cube resting on the horizontal plane with all the corners lettered. Lines—inclined lines, true length of a line, traces of a line, position of a point on a given line, angle between two straight lines; illustrated by means of paper and thread models, arranged by the student in his model of the three co-ordinate planes.

Study of solids, such as cubes, cones, pyramids, prisms, tetrahedron, and octahedron. Students will make their own models in paper, and with them determine the projections and true shape of oblique sections, a paper plane representing the cutting plane. Development of the surface of some of the above solids. Inclined sections of simple technical models. These sections will be determined by the student with the model in front of him.

All drawing work should be to a large scale, and on half-imperial sized sheets.

TECHNICAL DRAWING FOR MINERS.

All technical drawings must be carefully dimensioned and made to correspona to complete working drawings, and should be drawn to as large a scale as the half-imperial sheet of paper will allow.

Making a freehand dimensioned sketch from the metal technical models: the student will be directed to have sufficient information in his sketch to enable him to produce from it, without further reference to the model, a working drawing of the piece of machinery under discussion. The technical examples will be chosen with special reference to the industries of the students.

(2) MINING SCHOOL AT COWDENBEATH.

This school deserves special mention because it is such a school as might be established in one or more of the mining centres in Nova Scotia, such as Glace Bay. This school is doing a great work among the miners, not only in training officials but also in elevating the general average of intelligence of the miners.

The equipment of the school was substantial and very complete for the purposes of the school. There were many special pieces of apparatus designed by the principal, Mr. Joseph Parker, especially those connected with instruction in fire damp detection, which reflect the greatest credit on the designer. The principal has had a long practical career as a mine official and is retained in charge of the school because of his unselfish desire for educational and social service.

There is an excellent Mine Rescue Station with all the most modern mine rescue apparatus where the students of the school may be thoroughly trained in this line of work.

The idea of giving the mine firemen or "fire bosses" a special Course in the examination of mine air is especially to be commended. It means much for the elimination of danger in the mines of the vicinity because of the greater intelligence of these important officials.

Objects of School.

The school is established for the purpose of carrying out a liberal scheme of Technical Education in Mining and in the several branches of industry closely related thereto.

The organized Courses of Instruction are based on the requirements of Division III of the Code of Regulations for Continuation Classes issued by the Scotch Education Department. Systematic Courses extending over three or more years are provided, and in addition there is a Preparatory Course for those whose previous attainments do not fit them to enter at once with profit on the specialized work of their particular course.

The Laboratories are fitted in a thoroughly modern manner, and comprise:—

Chemical Laboratory.
Physical Laboratory.
Mechanical and Strength of Material Laboratory.
Hydraulics Laboratory.
Electrical Engineering Laboratory.
Mining Laboratory.

The school is affiliated with the Heriot-Watt College, Edinburgh, and arrangements have been made for students who have completed the Course at Cowdenbeath to attend Saturday afternoon Classes as follows:—

Laboratory Courses in Prime Movers. October to Christmas.

Laboratory Courses in Electrical Engineering (Alternating Currents). January to April.

Course of Lectures in Mining. October to April.

Travelling expenses are allowed to students attending these Classes.

ORGANIZED MINING COURSE.

1. Preparatory Year's Course, comprising:—English, Arithmetic, Drawing, Mensuration, and Physics.

2. First Year's Course, comprising:—Applied Mathematics, Class I; Mining, Class I; Physics and Chemistry (Lecture and Laboratory work).

3. Second Year's Course, comprising:—Applied Mathematics, Class II; Mining, Class II; Mathematics and Steam, Class I (Lectures and Laboratory Course); Summer Class in Practical Surveying and Drawing, Class I.

4. Third Year's Course, comprising:—Applied Mathematics, Class III; Mining, Class III; Technical Electricity (Lectures and Laboratory Course); Summer Class in Surveying, Class II.

5. Fourth Year's Course, comprising:—Applied Mathematics, Class IV; Mining, Class IV; Mining Laboratory, Class I; Electrical Engineering (Direct Current), Lectures and Laboratory Course; Summer Class in Surveying and Levelling, Class III.

6. Fifth Year's Course, comprising:—Mining, Class V; Mining Laboratory, Class II; Mechanics and Steam, Class II (Lectures and Laboratory Course); Electrical Engineering (Alternating Currents), Lectures and Laboratory Course.

7. Saturday afternoon Classes at the Heriot-Watt College for students who have successfully passed through the above Course. These Classes comprise:—

(1.) Half-session Course in the Mechanical Laboratory, making tests on engines, boilers, fans, etc. October to Christmas.

(2.) Half-session Course in Alternating Currents in the Electrical Laboratory. January to April.

(3.) Series of Lectures on Mining throughout the session.

Arrangements have been made with the Local School Boards, whereby the student may take portions of the above course at the Board School, and the remaining portions that cannot be dealt with at the local centres, at the Mining School, Cowdenbeath.

Students working under these arrangements must be careful to complete the full Course of each year before proceeding to the next year's Course.

Students may take their classes in Mining and Mathematics of the first year of Division III at local centres where such classes are held, and attend one evening each week at Cowdenbeath for Chemistry and Physics to complete the first year's Course.

Similarly, Mining and Mathematics of the second year's Course may be taken at the local class, and the student travel to Cowdenbeath for Mechanics and Steam to complete the second year's Course.

The organized Mining Course in the Preparatory Year includes English, Arithmetic, Drawing, Mensuration, and Physics. In the first year it includes Applied Mathematics, Mining, Physics and Chemistry. As illustrative of the work covered in all the subjects of the organized Course the details of the subject 'Mining' for each of the five years are cited. They contain information as to subject matter and arrangement which should prove useful in Canada.

MINING—CLASS I.

1. GEOLOGY OF COAL MINING.—Classification of rocks. The geological formations. The igneous rocks: their origin and characteristics. Fossils: their origin, method of preservation, and use. The carboniferous formation and its subdivisions. Occurrence of this formation in Fifeshire. Coal-bearing strata of Scotland and of England. Coal in formation other than the carboniferous. The origin of coal. Classification of coals. Strike. Dip. Outcrop. Lamination. Cleat. Faults, normal and reversed. Throw. Thrust. Washouts. Nip-outs. Rolls. Swellies. Balks, etc. Dykes. Sills. Useful minerals associated with coal.

2. PROSPECTING FOR COAL.—Outcrop. Surface indications. Examining ravines, cuttings, etc. Effect of surface contour on outcrop. Application of knowledge of geology to the search for coal. Boring. Methods. Tools. Chisel bores. Tubing the bore-hole. The lever and the spring pole in boring. Diamond drilling. Davis-Calyx drill.

3. SINKING AND SHAFT FITTING.—Ordinary methods of sinking and securing rectangles and circle shafts. Means of ensuring safety. Division of shaft into compartments. Fitting guides and buntons in a shaft.

4. DRAINAGE.—Bucket and plunger pumps: their construction and action. Discharge of pumps.

5. VENTILATION.—Composition of the air. The noxious gases found in mines and their properties. Testing for noxious gases: quantity of air required to dilute and render harmless. Coursing the air in a mine. Intakes and returns: stoppings, doors, overcasts, brattices. Laws of ventilation. Simple applications of the water gauge. The anemometer.

6. LIGHTING.—Lamps and candles. The safety lamp, principles of. Effect of high velocity explosive current on a safety lamp. The Davy, Clanny, and Stephenson lamps.

7. BREAKING GROUND.—Tools: picks, hammers, chisels, shovels, ratchet boring machines, multiple wedge, roller wedge.

8. MINE SUPPORTS.—Propping and securing the working face. Erecting sets of timber in roadways. Chocks. Packwalls.

9. HAULAGE.—Tubs. Rails. Self-acting and balance inclines. The cut-chain system. Horse Haulage. Main rope and tail rope system of haulage.

10. WINDING.—Cages. Ropes. Drums and brakes. Detaching hooks. Plan. Section. Elevation. Application to production of drawings of mine tubs, cages, pumps, pipes, rods, collarings, shaft timbering and walling, and mine supports.

MINING—CLASS II.

1. BORING.—Uses of bore holes. The American and Canadian systems of boring. Mather and Platt system. Fauk's 'Rapid' system. Wolski's hydraulic system. Free fall cutters. Keeping the journal of the bore. Accidents in boring. Cost of boring. Determination of dip and strike by three bore holes. Surveying bore holes.

2. SHAFT SINKING.—Sinking and walling together. Use of rock drills in sinking. Flottman and other types of drills. Walker's patent scaffold. Ventilation of pit sinking. Tubing shafts; forms of tubing, and methods of building up. Coffering. Piling. Sinking by freezing methods. Kind Chaudron method of sinking, and later improvements. Triger's method of sinking. Pattberg method. Use of pulsometer in sinking. Galloway's pneumatic barrel. Peacre's barrel. Closing the top of sinking pit. Balanced folding doors. Preserving perpendicularity of shaft.

3. DRAINAGE.—Fixing shaft pumps. Travelling a bucket set. Rods, buffers, guides, counter-balances, regenerators, special pumps (various types).

4. VENTILATION.—Noxious gases of mines. How to deal with each. Special precautions against carbon monoxide poisoning. How to provide a ventilating current. Natural ventilation. Furnace ventilation. Description of various types of fans.

5. LIGHTING.—Safety lamps (various types). Cleaning, lighting, locking and relighting of safety lamps. Handling and examining safety lamps. Statute Regulations regarding safety lamps.

6. BREAKING GROUND.—Tools. Power drills. Blasting. Explosives. Some types of coal cutting machines.

7. MINE SUPPORTS.—Timber. Varieties in use. Stocking timber. Preserving timber. Iron, steel, brickwork and reinforced concrete as mine supports. Strength of mine supports. Statute Regulations regarding timbering. Systematic timbering.

8. MODES OF WORKING COAL.—Stoop and Room and Longwall Methods. Single and double stall methods working thick seams by square work.

9. HAULAGE.—Endless rope system of haulage. Details of working. Various forms of clips. Pulleys, rollers. Management of curves.

10. WINDING.—Engines. Drums. Ropes. Cages. Keps. Koepe system of winding. Loading several decks simultaneously.

11. PREPARATION OF COAL FOR THE MARKET.—Tripplers (various types). Bar screens. Picking tables.

MINING—CLASS III.

1. SHAFT SINKING.—Shaft sinking in difficult cases. Reclaiming collapsed shafts. Calculation of the necessary thickness of barring, tubing, and walling for given cases.

2. DRAINAGE.—Pumping plants for specific cases. Details of construction. Air vessels. Calculation of size necessary. Charging air vessels. Suction air vessels. Cavitation in pumps. Causes, and how avoided. The syphon. The hydraulic gradient. Pump valves; relative advantages of various types. Special pumps. Electricity in pumping. Drainage during sinking; pumps suspended by ground spears and worked by rods from the surface. Pumps of various types suspended on wire ropes and chains. How installed and successfully operated.

3. VENTILATION.—Laws of ventilation. Supply of air required per man per minute. Coursing the air, in stoop and room and in longwall workings. Doors,

crossings, stoppings, regulators, etc. Splitting the air. The equivalent orifice, the equivalent airway and the mine temperament ideas. Duplicate and auxiliary fans. Surface and underground arrangements for reversing the direction of air currents. Fans: theory of. Quantity of air produced by given fans when operating on mines of given resistance.

4. COLLIERY EXPLOSIONS, AND RESCUE WORK.—Historical review. Part played by coal dust in colliery explosions. Recent confirmations of truth of coal dust theory. Prevention of explosions. Arresting of an explosion in mid career. Recovery of miners after explosions: rules for. Rescue apparatus of various types. Organization of rescue parties.

5. FIRE DAMP.—Methods of testing for fire damp. 'Caps' formed on various lamps by given percentages of fire damp in air. Removing accumulation of fire damp underground.

6. LIGHTING.—Lamp cabins. Cleaning, storing and handling of safety lamps. Electric safety lamps.

7. METHODS OF WORKING.—Shaft pillars. Laying out. Position, number, and inclination of main roads. Stoop and room, and longwall methods of working; their respective advantages and disadvantages; seams best suited to each. Longwall: working outward; working home; complete stowing; partial stowing; hydraulic stowing. Size of packwalls, width of roadways, height of ripping. Spontaneous combustion: causes of. Wax walls and draught board packing. Working thick seams by longwall. Working contiguous seams. Stoop and room. Size of stoops, and width of rooms. Methods of removal of stoops. Influence of thickness and inclination of seam on the method. Roof control: nature of the problem; straight face line; stepped face; angle with cleat and dip.

8. TECHNICAL ELECTRICITY.—Properties of magnets. Magnetic induction. Lines of force. Maps of magnetic fields. Laws of inverse squares. The earth's magnetism. Primary cells. Current of electricity. Magnetic field surrounding a conductor carrying current. Electro-magnets. Electric bells. Electrolysis, secondary cells. Current measurement. The tangent galvanometer. Fall of potential in a current-carrying conductor. Ohm's Law. Comparison of E. M. F. cells. Clark's standard cell. Measurement of resistance. Wheatstone's bridge. Specific resistance. Ammeters. Voltmeters. Wattmeters. The Potentiometer. Heating effects of a current. Efficiency of lamps. Induced currents. Introduction to theory of dynamos and motors.

MINING—CLASS IV.

1. TRANSMISSION OF POWER.—By steam: fall in pressure due to friction and condensation; disadvantages of steam. Steam pipes, traps, and expansion joints. Fixing of pipes in shaft; covering pipes. Condensation of the exhaust; water required. Condensers.

By Compressed Air.—Losses during compression; adiabatic and isothermal curves. Examination of diagram and sight of operations; deductions. Air compressors: good forms; forms to be avoided. Stage compression. Inter-

coolers. Receivers. Losses in transmission in pipes. Reheating. Temperature resulting from expansion of air. Prevention of formation of ice.

By Electricity.—Direct and alternating current installations. Forms of cables used. Support of cables in shafts and levels. Gate-end boxes; trailing cables. Earthing. Fault detection. Efficiency of transmission. Electrical rules for mines.

By Hydraulic Power.—Hydraulic machines. Turbines. Pelton wheels. Losses due to friction.

By Ropes and Rod.—Disadvantages; limits of application. Size of ropes and rods; general arrangement of efficiency.

The Oil Engine: mining applications; the exhaust from.

Comparison of methods; safety, convenience, initial cost, upkeep, efficiency.

2. HAULAGE.—Tubs; wheels; journals; axle lubrication. Self-acting inclines; their equipment. Brakes; fundamental equation to belt friction; friction brakes; block brakes; strap brakes; breast brakes.

Mechanical haulage: horse-power of engines required for. Driving pulleys. Various forms of clip pulleys. Clifton pulley. Laying haulage roads. Arrangement for branches and bends. Pulleys, rollers, etc. Clips.

Application of electricity to haulage. Compressed air and other locomotives.

Signalling. Haulage accidents. State Regulations on haulage.

3. METHODS OF WORKING.—Inclined seams. Working edge coals. Rearer workings; rabatage; inclined slices; horizontal slices; chambers.

Machine Mining.—Laying out the workings. Organization of the work. Size and type of the machine. Direction of the face. Economic influence of coal-cutters.

Coal Conveyors.—Various types: their application and installation.

The Coalfields of Scotland.—The Fife coalfield in detail. Short description of the Lothian, Clyde, and Ayrshire coalfields. Short description of the coalfields of England.

MINING—CLASS V.

1. WINDING AND SHAFT EQUIPMENT.—Ropes and attachment; adjusting screws. Strength and size of winding ropes. Cages, various forms. Catches for tubs on cages. Guides and shaft railway. Keps, various forms. Detaching hooks. Safety cages. Headgears, principles of design. Typical headgears of wood, rolled joists, and lattice work. Pulleys, their construction. Drums, their construction, size, and weight. Counterbalancing: conical and spiral drums; flat and tapered ropes; balance ropes, Koepe system. Winding from several depths. Whiting hoist. Winding engines, simple and compound. Calculations regarding winding engines. Indicators. Gears for the prevention of over-winding. Automatic cut-off gear. Application of direct and alternating currents to winding. Angling of ropes, methods of prevention. Arrangement of roadways on surface and on pit bottom.

2. PREPARATION OF COAL FOR THE MARKET.—Banking arrangements. Creepers. Tipplers. Screens: bar, Briait's, Baum-Briairt's, Coxe's, Humbo-

lat's, Karlick's. Shaking screens. Prevention of jar. Picking tables: of steel plates, of canvas; Cornet's picking band. Coal washing. Fall of minerals in water. Rittenger's Laws. Borne's rules deduced from Pernolet's Formulæ. Types of modern coal-washing plants. Accessory arrangements: bunkers, drainage screens, settling pond, elevators. Dry cleaning of dross.

3. COKE MAKING.—Coking coals. Principles involved in coke making. Types of ovens. Their respective advantages. Prevention of dead ends. Charging and discharging the oven. Quenching the Coke. Recovery of by-products. Details of the process.

4. SURFACE ARRANGEMENTS. — Boiler plant for collieries. Types of boilers used. Setting and building of boilers. Chimneys, their dimensions and construction. Forced draught and balanced draughts for boilers. Power house for collieries, its nature and equipment. Central condensing plants. Utilization of exhaust steam by Rateau turbines. Workshops: relative position and equipment of the various shops. Lamp rooms. Stores. Offices. Sidings.

5. STRENGTH OF MATERIAL USED IN MINING OPERATIONS.—Design and strength of tie for axial and non-axial loads, beams, struts. Strength of brickwork, masonry, cement, reinforced cement. Earth pressures. Thickness of retaining walls, and dams. Depth of foundations.

6. LEGISLATION.—Coal Mines Regulation Acts. Workmen's Compensation Act. The Colliery Manager and the Law.

7. CONDITION OF THE WORKMEN.—Health and diseases of the miner. Housing and education of the workmen.

8. ACCIDENTS.—Classification. Statistics. Means of prevention of each class of accident.

(3) HERIOT-WATT COLLEGE, EDINBURGH.

FIFTH WINTER SESSION.

Students who have completed the organized Course in Mining at Cowdenbeath are admitted to the Fifth Session Winter Course, held on Saturdays in the Heriot-Watt College, Edinburgh, and commencing on the last Saturday in September.

This course includes:—

(*a*) Mining Lectures.....6.40 to 7.40 p.m.

(*b*) Mechanical Engineering Laboratory (September to December).....4.40 to 6.40 p.m.

(*c*) Electrical Engineering Laboratory (January to April).....4.40 to 6.40 p.m.

SYLLABUS OF MINING LECTURES.

1. THE CLASSIFICATION OF FUELS.—The meaning and utility of proximate and ultimate analysis. Sampling. Classification from analysis; carbon-hydrogen system; fuel-ratio system: Seyler's, Parr's, and Gront's methods. Connection of calorific power and analysis. Oil-shale analysis.

2. ADVANCED VENTILATION.—Discussion of the ventilation tests conducted in the Fourth year. Limitations of Atkinson's theory. Application of Bernouilli's theorem to mine ventilation; application to *évasés* and fan passages. Mechanical ventilators; derivation of general formula for manometrical efficiency of fans with non-radial vanes. Relation between manometrical efficiency and useful effect. Principles of fan design. Fans of the propellor type. Secondary ventilation; installation of auxiliary fans; power and quantity relations. Working gauge pressure from plans. Equivalent orifice.

3. CALCULATIONS ON WINDING PLANT.—Discussion of some recent tests of winding engines; their help in calculating the size of such engines. Counterbalancing; proportions of conical and scroll drums; flat and taper ropes, etc.; overbalancing.

4. ADVANCED POWER TRANSMISSION.—Air compression; isothermal and adiabatic laws; energy losses; forms of compression; Reavell's hot transmission system. Electricity; relative advantages of direct and alternating current for mining purposes; the revised special rules for electricity; mining switch gear; transformers and transformer stations; voltage regulation; load diagrams, etc.

5. APPLIED ELECTRICITY.—Applications of electric power to machine-driving in mines. Specifications of mining motors; rating; plate and other protection; upkeep of electrical plant. Electrical winding; Siemens-Ilgner, and Westinghouse systems.

6. PREPARATION OF COKE.—Suitable coals; principles involved in coking. Coke making in bee-hive and retort ovens. Nature of by-products and their recovery.

7. SHAFT SINKING IN DIFFICULT CASES.—Kind-Chaudron method and modifications. Pattberg and Hydraulic methods. Sinking through running ground by piling and spiling. Caisson sinking. Triger's and Poetsch's methods. Cost of special processes.

LABORATORY WORK.—During the first half-session the students undertake tests of boilers, steam and gas engines, and perform experiments on the strength of pit timber, coupling chains, etc.

During the second half-session the practical course includes the testing of ammeters, voltmeters, fuses, circuit breakers, accumulators, arc and glow lamps, wiring insulations, direct-current dynamos and motors, impedence coils and induction motors.

ECONOMIC MINERALOGY.—A class in this subject is held during the Winter Session on alternate Saturdays, 3 p.m., to 4.30 p.m. The course includes practical work in the detection of minerals, and a number of short lectures on their characteristics.

SPECIAL COURSES.

The following Special Courses will be given:—

1. A Class forming a preparation for the Colliery Manager's Certificate.

2. A Class forming the preparation for the Under Manager's Certificate.

3. A Half-Session Course (Jan. to April) in Strength of Materials, for colliery managers.

4. A Half-Session Course (September to December) in the Examination of Mine Air, for colliery managers.

5. A Special Class in Electrical Engineering, for colliery officials.

6. A Class forming a preparation for the Fireman's Certificate.

For the convenience of men in official positions, who find Saturday afternoon the only free time during the week, the classes for special Courses 1 and 2 will meet on Saturdays from 4 to 6 p.m.

The curriculum includes: Coal Mines Act. Ventilation. Lighting. Sinking, fitting, and pumping. Haulage. Winding. Modes of working. Mine gases and coal dust. Strength of materials. Applications of electricity to mining. Surface arrangements. Surveying and levelling.

Special classes for colliery managers, special electrical classes for mine officials and a course for mine firemen, are also held.

The co-ordination of the work of the Continuation Classes throughout the County of Fife with the work at the Cowdenbeath Mining School and the more advanced work of the Heriot-Watt College together provide appropriate courses of instruction and training for mine workers from the elementary grades up to the highest technical qualification necessary for practical work as superintendent or manager.

SECTION 3: GERMANY.

The Collieries Provide the Funds.

In Germany the schools for the training of mine officials, especially in colliery districts, are provided by the mining corporations without any grant from the Government. The companies form an association for the establishment and maintenance of a mining school for their district. The members of such an association usually include representatives of all collieries with a certain minimum output per year. Then a tax of 20 pfennige per thousand metric tons (in Essen 4 pfennige per 20 metric tons) is levied on the output of the mines which are represented voluntarily in the association.

The buildings and equipment which were visited in Aachen and Essen were in every way adequate for the purpose. Beside the central schools, preparatory schools are maintained by the mining companies in various localities in the district.

Uniforms and Wages.

At the preparatory schools the instruction is usually given in the evening, but at the central mining school the training is given in the daytime for 20 to 24 hours a week for 2 or 3 years. In Aachen the students are given a uniform and are paid a small sum of about 50 cents a day for every day they attend the school. This sum, together with the money they earn by working regular shifts in the mine on days when the school is not in session, enables the students to support themselves while obtaining their education even though married.

In Essen the yearly report of the mining school for 1910-11 shows about one third of the entering students as married men. These schools are usually

free to students who work and live in the district in which the collieries provide the funds, and pupils from outside pay a small fee.

The mining organization in Germany is different from that of Canada, with more minor officials than is the custom here. The pay of miners and foremen in the collieries is also less than here. In the Essen district a coal cutter (hand work) earns about $500 a year. An assistant foreman (*Hilfsteiger*) gets $650 to $750 a year, underground manager or a foreman (*Steiger*) receives $800 to $1000 annually and the manager (*Obersteiger*) is in receipt of a salary of $1250 to $1500.

Nearly all Officials are School Trained.

There are scarcely any officials who have not been through the regular course in a mining school. The examination is conducted by a board on which are the government mining inspectors, local or district government officials, the faculty of the school and representatives of the coal mining operators. The man who passes through the school and examination receives a government certificate of proficiency and is accorded some social prestige according to his grade of diploma. The instruction in the school is of such a high order and so thorough that very few fail in the examination.

No boys are received into the mines until they are 16 years of age, so that they usually stay in the public schools until that time. Then they attend some Continuation School until they are about 18 years old. In Prussia the mine operators are compelled by law to allow any boy in their employ to attend a Continuation School which is recognized by the state or local authorities until he is 18 years of age. At 18 they may enter the Mining Preparatory School and get ready to enter the Mining School. No students are received into the Mining School who are not 20 years old and who have not had 4 or more years of practical experience in mining. Some do not enter until they are much older, as in the report of the Mining School at Aachen the ages of the pupils run from 20-35. The men who attend the Mining School cannot enter unless they are recommended to do so by the mine operators, because the schools are supported by the latter. This introduces a condition which would not be accepted in Canada.

There are in Prussia 10 schools for the training of intermediate technical mining officials, with 2 years in the lower classes and one year's course in the higher classes. As introductory to these schools there are in Prussia 43 Preparatory Schools in which also the lower kind of mining officials can be trained.

Regulations for Safety.

One of the State mining regulations provides that the mine air in any colliery must not have more than 1 per cent of fire damp in any part of the mine that is working. A sample of the mine air has to be analyzed every 3 months. The sample is taken by the Fire Boss in the mine and sent to a laboratory sustained in each district by the mine operators. This laboratory is usually included in the mining school building of each district. The coal mining industry

of Germany is in a very flourishing state at present. In the Aachen district the increase in the last few years has been about 20 per cent a year. With the increase in depth and extent of working in the mines the problem of coping with fire damp has also grown more difficult so that the Mining Schools have been sorely taxed to provide the necessary number of mine officials. Germany is noted for the low loss of life per 1000 employees and the Director of the School attributes much of this satisfactory condition to the thorough education of the miners and mine officials.

(1) AACHEN (AIX-LA-CHAPELLE).

The Mining School here is a splendid building erected, equipped and maintained by the Coal Mines Association of the Aachen District (*Vereins der Steinkohlwerke des Aachener Bezirks*). The principal coal mine operators are the contributing members and the upkeep is provided by a light tax on the output of this district. The association was formed in 1867 and used to conduct a school in another town. The present building was erected in 1904 at a cost of about 225,000 marks.

There are five Mining Preparatory Schools in the district under the direction and control of the Director of the School.

COURSES FOR FOREMEN AND MANAGERS.

There are two and three year courses in Mining. The two year course prepares a man for his certificate as foreman or underground manager (*Steiger*) and is the one most largely attended. The three-year course prepares a man for his certificate as superior foreman or manager (*Obersteiger*). There is also a one year course for the training of mechanical foremen (*Maschinensteiger*) to superintend the mechanical equipment and mechanics necessary for the operation of a colliery. This course is offered only every other year, so that there shall not be more men trained for this position than is necessary. It has only a small attendance.

CHARACTER OF ATTENDANCE.

There were 83 pupils in attendance in 1910. There are no fees except to outsiders, i. e., men who come from mines outside of the Aachen district, and these pay 250 marks per year tuition. There were 17 of these at the time the School was visited.

For the year which opened April 17, 1911, there were forty-eight applicants and forty-two of these were from the five affiliated Mining Preparatory Schools. Of these twenty-five were selected who had attended the Mining Preparatory Schools and five from outside this territory. Only five of the applicants were accepted for the course for mechanical foremen (*Maschinensteiger*).

In the Mining Preparatory Schools at surrounding colliery centres the following attendance was recorded in those under the inspection of the Aachen Mining School:—

At Kolscheid	25
At Herzogenrath	11
At Mariadorf	25
At Nothberg	23
At Homberg-Hochheide	18
	102

The School conducts a regular three years course—24 hours each week. The two lower classes are called "Unter" or elementary, the upper class "Ober".

The instruction is given to each class for three whole days a week and on the other three days the students work on regular shifts in the mine. Students are paid 2 marks per day for days they attend school and they make 12-15 marks more per week on regular shifts in the mine.

There are 3 regular professors on the staff and 3 assistants who give part of their time to the work. The Director has had a long and distinguished practical experience, and each teacher is a specialist in his line.

The equipment of the school is very complete, especially in the splendid library of 5000 volumes and in the collection of mine models, boring machines, and models of special arrangements for sinking through watery strata.

Content of Courses.

The courses in the German Schools are so much like those which have been described in connection with the English and Scotch Schools that details of them have not been given here beyond a syllabus showing the division of time per week to the various subjects in each of three years in the general courses and in the first year of the course for mechanical foremen.

FIRST YEAR.	Hrs. per week.
German	2
Arithmetic	1
Mathematics (Algebra, Plane Geometry, Trigonometry, Solid Geometry)	2
Machines	2
Machine Drawing	3
Mineralogy and Geology	2
Mining	7
Mine Regulations	2
Surveying	3
	24

SECOND YEAR.	Hrs. per week
German	2
Arithmetic	2
Chemistry	2
Physics	2
Mathematics	6
Mechanics	2
Mining	2
Surveying	3
Machine Drawing	3
	24

THIRD YEAR COURSE.	Hrs. per week
German	2
Technical Chemistry	2
Physics and Technical Electricity	2
Machines	2
Machine Drawing	3
Building Construction	2
Mineralogy and Geology	1
Mining	3
Ore Dressing	2
Mining Regulations	1
Surveying and Plotting	3
Mining Accounting	1
	24

The syllabus for the Course for mechanical foremen is as follows:—

FIRST YEAR.	Hrs. per week
German	2
Arithmetic (applied)	1
Mathematics	2
Physics and Chemistry	2
Electrotechnics	2
Mechanics and Strength of Materials	2
Elements of Machines	2
Theory of Machines	2
Workshop Science	1
Machine Drawing	6
Mining	2
	24

(2) ESSEN.

Sources of Funds for School.

The Mining School is under the control of, and supported by the Essen Mining School Association (Essener Bergschule Verein.) This Association was formed in 1810 but was disorganized in the fifties and later resurrected in 1863. The present building was erected in 1908 at a cost of about 550,000 marks. A sinking fund was provided for the amortization of the capital cost of the building in 10 years. There are 40 contributing members and the sum for maintenance is raised by a levy of 4 *pfennige* on every 20 metric tons produced in the mines operated by the members. (There is a production of about 25,000,000 metric tons per annum in this district.)

The present Director, Königlicher Bergrat Gerlach, was responsible for the establishment of the school. He started the campaign among the members of the Association and in two months had the requisite amount of money promised. In two months more the site was purchased and the plans ready so that construction started at once. The city of Essen granted the school a remission of street taxes and the unearned increment on the land.

The Mining Preparatory Schools in this district are supported by and under the control of an Association called the *Bergwerkschaftscasse* with headquarters at Bochum. The preparatory classes in this district are held in the afternoon generally but sometimes in the evening. The classes are held 2 or 3 times a week for two years and each session lasts 2 to 3 hours.

Courses and Equipment.

Only a two years' course in mining is offered at present leading to certificates of assistant foremen (*Hilfssteiger*) and foremen (*Steiger.*) The men in the courses work a shift in the mine from 6 a. m. to 2. p. m. and then attend school from 4 to 8 p. m. on 5 days a week in the first two half-year terms and 6 days a week in the last two half-year terms. Some of the students work on night shift from 10 p. m. to 6 a. m. instead of the morning shift.

It is not required at this school that a matriculant shall have attended the preparatory school.

There are 160 pupils in attendance, 40 in each half-year course. Owing to the great expansion in the coal industry, the demand for mine officials can be supplied with difficulty.

The men in each half-year course make ten hours of inspection of a geological nature or to notable installations of power machinery, coking plants, boring and shaft sinking operations, etc., during the term.

Each student must present a carefully kept account of his practical work in the mine in a special book provided for this purpose.

The equipment of the school is very costly and extensive although it is being added to each year. All of the lecture rooms and laboratories are fitted up in the most modern manner.

At the school, a separate building is used to illustrate mine working and also as a rescue station. The building contains a short shaft, two short levels, a clinte and an air crossing. All the different kinds of timber sets are shown together with modern methods of supporting levels which are in permanent use in a mine by means of steel and concrete. A furnace is attached by means of which the whole model mine may be filled with smoke and a practice obtained in the use of rescue apparatus. There is also a long room with a glass front which is filled with smoke and demonstrations of rescue apparatus of different kinds carried out.

SUBJECTS OF INSTRUCTION.

	1st. ½ yr.	2nd. ½ yr.	3rd. ½ yr.	4th. ½ yr.
Mining, including prevention of accidents	6	6	7	7
Mining and Industrial Regulations			1	1
First aid to the Injured				1
Rescue work	part time afternoons.	on	free	after-
Mathematics	4	4	3	3
Mechanics, Machinery and Electricity	2	2	2	3
Surveying		3	4	3
Physics and Chemistry	2	2	2	2
Drawing	3	2	3	3
Mine Accounting				1
German	3	2	1	
	20	21	23	24

The instruction in the school is given from 4 to 8 p. m. In the mornings the students work a day's shift from 6 a. m., to 2 p. m. concerning which they keep a record in a day book. In this way care is taken that the theoretical and practical training of the students goes hand in hand.

The attendance is very regular. Some of the teachers are engaged for part time instruction. All are experts in the special subjects which they teach.

The students make a number of visits, usually ten, to noteworthy mines, power plants and industrial establishments in the vicinity and must hand in carefully prepared reports on the same.

DETAILS OF COST OF MAINTENANCE.

Although the character and scale of expenses would be different in Canada from Germany, the following particulars regarding these two schools at Aachen and Essen are submitted as illustrating the relative amounts spent on different divisions of the work there. A mark is equivalent to about 24 cents.

AACHEN.

The cost of maintenance of the school is given in the following statement.

	1909 Marks.	1910 Marks.
Salaries	19698.02	25565.34
Materials for instruction	240.00	85.05
Maintenance, upkeep and additions to Museum	4102.98	9261.44
Maintenance of school building	1565.43	1530.65
Water, gas, electricity, heating	1228.26	1112.38
Excursions and inspection of Mining Preparatory Schools	915·70	758.20
Sundries	517.00	715.73
	28,267.39	39,028.79

ESSEN.

The expense of carrying on the school in 1909-10 is given in the following statement.

	Marks.
Management	4500.00
Teachers' salaries	18624.98
Apparatus	5063.75
Excursions for students	1776.06
Representation	3000.00
Books	379.05
Janitor service	2493.20
Heating, lighting, water	3872.46
Taxes	2305.77
Maintenance of building, etc	1047.13
Interest on loan	10900.05
Sundries	4319.59
Construction	43742.34
Amortization of loan	57500.00
Balance	32971.76
	192,496.14

If the last three items are deducted from the total it will be seen that the actual maintenance of the school is about 60,000 marks per year outside of the expenses attendant upon the new building.

SESSIONAL PAPER No. 191d

SECTION 4: FRANCE.

(1) ST. ETIENNE MINING SCHOOL.

This is a national school intended to train directors and engineers for the operation of mines and metallurgical factories. It is managed by a chief engineer of mines, and is located in one of the most important industrial cities in France, in the midst of one of the richest coal basins, and of industries of the most varied character. The pupils, moreover, enjoy the inestimable advantage of being able to verify continually by practical application the theoretical lessons they have received.

As a matter of fact, it is the ex-pupils of the St. Etienne School of Mining who today guarantee to France the working of her coal mines. Out of the 450 engineers who, it was calculated, were directly engaged in the extraction of coal throughout France, 278 came from the school at St. Etienne, 32 from the Central School, 72 from the Superior School of Mining, and 28 from the schools for master miners. The other 40 came from various other schools or from none at all. This school also furnishes engineers to metallurgical establishments and also to chemical industries in France and abroad. According to statistics of the metallurgical industries of the Loire, compiled some years ago, out of 56 superintendents or engineers who were graduates of the large schools, 32 had belonged to the school at St. Etienne.

The school accepts French pupils appointed by competition, and foreign pupils accepted after examination, also outside students (visitors).

From the very foundation of the school the tuition was free, although the majority of the pupils came from families which were not in straitened circumstances, but since 1908 the financial law provides for an annual fee of 200 francs from each pupil, while visiting pupils pay 50 francs for each course.

Qualifications for Admission.

The qualifications for admission to the school at St. Etienne are similar to those of the Central School, with chemistry in addition, but the places are more strenuously competed for and it is more difficult to gain admission here than to the Central School, the examination in mathematics being often as difficult as that of the competition for admission to the Polytechnic School. The difficulty of maintaining one's position in the St. Etienne or Central School is about the same. The exclusions are about one-fifth of the promotions.

The number of places is determined each year by the Minister of Public Works. These were 40 in 1906 and 35 in 1907, 1908 and 1909.

Candidates must be of the full age of 17 years and not over 26 years of age on January 1 of the year of competition.

The examinations for admission consist of (1) a problem in mathematics; (2) a problem in physics and chemistry ; (3) French composition; (4) dictation; (5) a diagram in descriptive geometry; (6) a freehand drawing of any object:

(7) a calculation in trigonometry. The two first problems entitle to 2 marks, one for the groundwork and the other for the form, the latter having in view the order and clearness of the explanation, correctness of language, orthography, material, execution, etc.

The special marks assigned to each composition are as follows:—mathematics, groundwork 8, form 2; physics and chemistry, groundwork 6, form 2; French composition, 8; dictation, 4; diagram in descriptive geometry, 6; freehand drawing, 4; calculation in trigonometry, 2.

The number of pupils admitted to the oral examinations may not exceed 2½ times the annual number determined on for admission. Pupils who are eligible undergo two oral examinations in mathematics bearing on geometry, algebra, analysis, trigonometry, analytic geometry of 2 and 3 dimensions, mechanics, descriptive geometry; one oral examination in physics; and one examination in chemistry. The coefficient of the two first examinations is 18, that of the examination in physics being 10, and chemistry 8.

Pupils who desire it may request permission to undergo an oral examination in German or English, the coefficient for which is 3. The examination may bear upon both German and English; the best mark obtained is then multiplied by the coefficient, 3; and the second enters into the total marks with the coefficient, 1.

Graduates from the Polytechnic School, either in the preceding year if they have to do military service, or in the same year if not, may be admitted directly into the second year of studies here, the number so admitted being determined by the number of places available. The school is for day-scholars.

Courses of Studies.

The course of studies takes 3 years.

The first year is more especially devoted to theoretical courses in mathematical analysis, rational and applied mechanics, construction, physics, chemistry, mineral analysis, mineralogy, and surveying.

The other two years are devoted exclusively to applied courses, viz: construction, industrial electricity, working of mines, applied mechanics, metallurgy, mineral analysis, geology, railways, mining legislation, and industrial economy.

Pupils are trained in chemical manipulations, especially in the analysis of mineral substances and chemical products; in practical electric measurements; in the various sorts of drawing, machine drawing, and the drawing of subterranean and surface plans. They are obliged to make projections on the practical courses. They pay numerous visits to the mines and to metallurgical establishments, and make geological expeditions.

At the end of every year the pupils undergo examinations, which they must pass in order to be promoted into the higher division. All pupils who do not obtain at least 60 per cent of the possible marks during the year are obliged to remain 2 years in the same class, while those who obtain less than 50 per cent are excluded.

At the end of the second year and during the third year the pupils make two trips for study throughout France or abroad: the first permits residence at a mine or a factory. Each trip forms the subject of a special report.

Pupils are recommended to spend their holidays abroad during the first year, in order to perfect themselves in modern languages.

Expenses, Uniform, Diplomas, etc.

All pupils are obliged to prove at the end of every month that they have paid their board and lodging, generally about 100 francs per month.

Uniform costs about 200 francs. In undress the pupils wear the cap only, having two gold stripes with the pick and hammer as a coat-of-arms.

The two principal preparatory centres for the St. Etienne School of Mining are the Lyceum of St. Etienne and the secondary free school of the Point-du-Jour (called des Anglais), at 5 rue des Massues, Lyons. Pupils may also be prepared in any class of special mathematics, or in a division devoted to preparation for the Central School.

The Minister of Public Works, on the completion of the course, grants a diploma of *ex-pupil of the School who is qualified to exercise the functions of civil engineer* to those only who have obtained at least 65 per cent, of the total possible merit marks during the whole course of study. Those obtaining less than 65 per cent receive a certificate of studies. Though the management does not guarantee positions to the young men entrusted to its care, yet through the medium of the school all pupils leaving obtain, without difficulty, positions as engineers at a salary of 2,400 francs, which is afterwards gradually increased.

(2) SCHOOLS FOR MASTER MINERS.

There are two practical schools in France for training master miners and miner geometricians. They are situated at Alais (Gard) and at Doyai (Nord). They were reorganized by decrees of March 29, 1907. They are for boarders. Tuition is free, but board is charged for. Scholarships are awarded by the State, the departments and mining companies.

The course lasts two years, comprising four practical stages, during which the pupils are distributed among various mines in the locality where they are received as workmen under the control of the working heads, but are under the supervision of the school, and when they return they give an account of what they have observed.

The theoretical instruction comprises: (1) a rapid review of the subjects on the entrance program, followed by algebra and geometry; (2) trigonometry, numbered geometry, topography and laying out plans; (3) elements of mechanics, physics, chemistry, mineralogy, and geology; (4) linear drawing and machine design; (5) working of mines; (6) French. This instruction is conducted in an essentially practical spirit, so that it is always readily understood by the pupils.

The marks given by the professors during the year, those obtained for good conduct and diligence, and those earned during the practical periods, all

contribute, with the marks at the final examinations, towards the position of the pupil in the final classification table. Those who at the end of the first year have not obtained a sufficient number of marks are permitted to remain another year in the same class, or are finally excluded.

At the end of the second year diplomas of master miners are granted by the Minister of Public Works, Post-offices, and Telegraphs to pupils who have obtained at least 65 per cent of the total merit marks, the classified rank and number of diplomas granted being mentioned on the diploma. Those who have obtained less than 65 per cent and over 55 per cent receive from the prefect a certificate of studies.

Admission, Examinations, etc.

Candidates for admission to the two schools must be French, at least 18 years of age on the first of January of the year of competition, and prove that their habits and conduct are good, and that they are suited for working in mines. They must have completed at least 500 days of paid work in underground portions of mines in France, Algeria or Tunis, and must have a good elementary education.

An eliminatory examination is held during July at the chief town of each department or district where candidates have been enrolled. It consists of two written compositions, dictation, and a paper in mathematics bearing on the subjects required at the oral examination.

The final examination is held at the schools. It bears on the theoretical knowledge hereinafter specified, and on the practical elements acquired by the candidates in the course of their work in the mines. The tests and coefficients are as follows:

Written Examination.—

Dictation: orthography 5, writing 2, problems 8; total 15.

Oral Examination.—

French: explanation of an ordinary text, 3; Arithmetic: decimal numeration, the four rules, divisibility, prime numbers, greatest common divisor, least common multiple, ordinary fractions and decimals, ratios, and proportions, 5; Metric system: length, surface, volume, weight, and currency, 3; Practice in calculating: problems in application, interest, distributions, etc. 5; Geometry: the straight line and the circle ; measuring surfaces and volumes, 6; Algebra: algebraic calculus, resolution of degrees without discussion, 3; Practical knowledge of the working of mines, 10. Grand total 50.

In order to be able to follow the courses of the school profitably and without difficulty, it is essential for candidates to have a good elementary knowledge of the mathematical sciences as above.

(3) SCHOOL OF CANDIDATES FOR HIGHER POSITIONS IN MINES, ST. ETIENNE.

In 1891 the difficulties and dangers of all kinds, which were increasing with the extension of the underground work and the deepening of the workings, induced the directors of mining companies of the St. Etienne basin to recognise the fact that the former "overman"—an ordinary workman with more experience and intelligence than the rest—no longer sufficed for the mission which he had to fulfil, and which had become so important. Therefore the mineworkers who belonged to the Committee of the Collieries of the Loire decided in 1892 to organise courses in order to give some of their workmen the general and special rudiments necessary to fill the functions of deputy-overman and overman.

Every mineworker who belongs to the Committee may send one workman to those courses for each 200,000 tons or fraction of 200,000 tons extracted annually. Those mineworkers who are not on the Colliers' Committee may ask to have their workmen admitted.

The courses last for one year, from November 1st to September 1st. The instruction is given in common every day from 3 to 6 p.m. The pupils spend the morning at work in their respective workings. They receive 5 francs for every day they are present at work and at the courses.

The knowledge required for admission comprises ordinary reading, writing, the practice of numeration, the four rules of arithmetic, and the metric system. Candidates must have worked for at least two years in a mine, and have completed their military service or have been exempted from it.

The instruction comprises: arithmetic 30 lessons, geometry 30, mechanics 10, physics 10, chemistry 10, working of mines 50, accounting 10, elements of laying out plans 10, thorough and detailed study of the laws relating to the safety of mines 20.

The school has been in regular operation since 1892, with an average attendance of from 16 to 18 pupils a year. It has given the best results from the point of view of the operation of workings and the safety of the workmen.

CHAPTER LXXII: SCHOOLS FOR FISHERMEN.

SECTION 1: INTRODUCTORY.

The fishery interests of Canada are important, not only because of the annual value of the catch and of the by-products, but because of the large number of men employed in them and of the population depending upon revenues from them. As illustrative of this, the following quotation is made from the testimony before the Commission of Mr. John Sinclair, M.P., and at that time Chairman of the Parliamentary Committee on Fisheries.

No system of Technical Education in Nova Scotia would be complete if it did not deal in some way with the Fishery industry which annually produces some eight millions. Nova Scotia stands first in all the Provinces of Canada as a fishing Province employing about 25,000 men, who represent 125,000, or about a quarter of the population of the Province. The fishermen are scattered all along the coast in villages on the Atlantic, the Gulf, and the Bay of Fundy. The business has changed of late years by the introduction of motor boats, and it is necessary that fishermen should understand the machinery of them, and also build their own boats, as well as market and pack their catch.

That there is great room for improvement, and need of improvement, in the way in which the curing and other preparation of fish for the market, is carried on, is made evident by the testimony before the Commission of Mr. Howard H. Smith of Halifax. The following are taken from his statements.

"The Government should collect and distribute more intelligent information with regard to habits and movements of mackerel, herrings, cod, etc. The prevailing winds, currents, and temperature of the water all affect the bait fishes, and govern the movements of the food fishes. Our fishermen are quite ignorant of the known fact that fish are only obtainable in water of a certain known temperature, and that it is wasting time to try for them otherwise.

"The Norwegian Government takes a fatherly interest in the industry there and by technical education and practical demonstration secures best results for its men. Norwegians never think of setting nets for mackerel, herring, etc., without testing the temperature of the water. They split their pickled fish a few hours after capture, and wash it in running water, thereby attracting all blood, and making the flesh perfectly white; then pack immediately in export packages, keeping the original pickle on the fish and conserving its pristine flavor. Result:—Norway Mackerel commands 100 per cent more money than equally fat and exactly similar (out of the water) Nova Scotia cure.

"Our fishermen put mackerel in puncheons to soak in bloody water, and pack weeks afterwards, losing the entire flavor of the fish. They *economize* by buying a cheap barrel which will not hold pickle. Result:—rusty, discolored fish, worth $6 a barrel instead of $15. It sounds strange, but is absolutely true.

"Listen to this also. A Lunenburg Banker will wash 1,000 qtls. of green fish in the same water, in order to save a few barrels of refuse for fertilizing:—value 50c. per bbl., total, $2.50; and deteriorate value of catch 50c. per quintal, total, $500; nett loss, $497.50. I can prove the absolute truth of this happening time and again. The old fishermen refuse to change their antiquated methods; the Government will have to educate the young by training several brainy, enthusiastic young men who will devote their time to teaching up-to-date methods to the fishermen and their children."

The same question, as applied to another kind of fish, was touched upon in the testimony of Dr. Edward E. Prince, Dominion Commissioner of Fisheries. In reference to herrring he said that several schemes had been attempted by the Government for the improvement of the curing and packing of them.

"One was to improve the salt sea herring of Canada, which packed in barrels brought only $3 or $4 a barrel while Scotch cured herring realised from $10 to $15 a barrel. When the question was put as to why Canadian herring were so low in price and so little esteemed, it was said that they were inferior fish and that our Canadian herring are not equal to Scotch herring when in the sea; that the fresh Scotch herring is a better fish. On my suggestion to the Minister of Marine and Fisheries, it was arranged to bring out an expert curer and cooper to make barrels, and six or eight girl curers who gut the herring—what we call "gutters" in Scotland—and they were stationed at Canso and down at Clark's Harbour. They also went out to B.C. and different points. They fixed up a small curing establishment and put up herring. A great many fishermen went there and saw this, and the result of the experiment was that herring quite equal to any cured herring in the world were produced out of our Canadian herring. Good barrels of herring were put up and shipped away to New York, some to St. Petersburg, etc."

SECTION 2: SOME CONCLUSIONS.

From the testimony submitted to the Commission, the needs of those directly engaged in fisheries appear to be of two kinds. One is connected with the catching, curing, packing and marketing of fish, and the other with the managing of engines or other machinery used in modern vessels and having sufficient knowledge of navigation.

The testimony of Professor Prince sets forth with considerable fulness the situation and needs in Canada and how they might be met. It also indicates something of what has been done in other countries.

The statement from Dr. T. Wemyss Fulton of Aberdeen describes what is being done in other countries, and presents some valuable suggestions as to lines of work that might be taken up, particularly in connection with schools and school courses.

The Commission is of opinion that, in the interests of the fishermen and the fisheries of Canada, further improvements and extensions of what is at present being done should be made by the following means:—

1. The issuing of simple and well illustrated Bulletins for the service of fishermen, similar in plan to those issued by the Experimental Farms and Agricultural Colleges.

2. The employment of Travelling Instructors to give short courses of demonstrations suitable for fishermen at centres easily accessible to them.

3. The provision of Short Courses of from one to two weeks' duration similar to those which are described as being given at Piel, near Barrow-in Furness, England, and at Aberdeen, Scotland.

4. The inclusion of Nature Study, in connection with marine life and fishing and some suitable practical work for the pupils in the Elementary and Secondary Schools in fishing communities.

5. The provision of Middle Winter Schools for fishermen having courses of instruction of two kinds, one kind dealing chiefly with the life and habits of fish, methods of catching, curing, packing and marketing; the other kind dealing with matters of navigation, and including courses of instruction in the use of engines, machinery and mechanical plant used in the industry.

6. The establishment of one or more Central Schools (*a*) for the Maritime Provinces, (*b*) for the St. Lawrence, (*c*) for the Great Lakes, (*d*) for the Pacific Coast, to provide courses of instruction similar to the Winter Schools, but more advanced in character.

After a time one or more of these Central Schools might provide the highest forms of scientific instruction for those who would be required as technical experts. Either the Winter Schools or these Central Schools, if located near a fish hatchery, could be used for the technical and scientific instruction of hatchery officers.

SECTION 3: STATEMENT BY DR. EDWARD E. PRINCE.

The Chairman of the Commission:

DR. PRINCE has been in charge of the scientific and some other branches of the Fisheries Department for nearly 20 years. During that time he has become personally familiar with the conditions under which men follow fishing, and also with the conditions which make for the conservation of the fishery resources. He has also knowledge of the legislation and regulations which have been enacted towards that end. He knows of the assistance offered to the fishermen in opportunities for training or guidance as to how best to catch, cure, or market fish. In Canada we have been rather meagre in the provision we have offered to fishermen in these three respects, but what we have done can be stated better by Dr. Prince than by any other man in Canada.

EDWARD E. PRINCE, Dominion Commissioner of Fisheries: I may state my past relation to the fisheries both in this country and in Britain to indicate to you in what particular directions it seems to me Technical Education might benefit the fishermen and their industries. I speak with some knowledge of this subject, because I was a scientific investigator in the early days of sea fisheries investigation. I am not claiming too much when I say that I probably was one of the pioneers in this work. There are a great many most important facts in regard to fish life, especially in the sea, which came to my knowledge in the course of the investigations carried on about 30 years ago, chiefly in Scotland, and also in England. One important fact which came to my notice, which had really not been known before, either to fishermen or scientific men, was that

all the most important food-fishes in the sea, instead of depositing their eggs on the bottom of the sea—as most fishermen believed and the general public still believe—deposit eggs which float near the surface of the sea. That was so important a fact, and so contrary to the belief of fishermen and the public, that the scientific men who first announced it were denounced very strongly, and one distinguished scientific friend of mine had his effigy publicly burnt by the fishermen for announcing that fish spawn floated. That is all ancient history now, and the fishermen have adopted the views of experts on this matter—that with the exception of the herring, all the food-fish in the sea have floating eggs. I instance that to show how much need there was for accurate information in regard to fish life in the sea.

Then I had some experience in regard to Technical Instruction, because I think I was the first to give some lectures to fishermen along the Scottish coast at the suggestion of the late Lord Tweedmouth, who was the member for Berwickshire in the British House of Commons. He had a lot of fishermen in his constituency, and he arranged with some of the County Councils for lectures to them. The object was to inform fishermen as to the most accurate information which had been obtained in regard to fish life, the habits, the structure of fishes, and so on. The structure of the fish is of some interest to fishermen because in curing fish the fishermen often leave what is called a streak of blood below the backbone of the fish. That streak of blood is really a very important organ; it is the kidney of the fish, and when decayed, it is perhaps the most offensive organ in the body, and being left there, it taints and ruins the cured fish. Technical Education on this point would stimulate fishermen to see that fish were properly cleaned. Many other little facts of that kind would be of value for the information of fishermen.

When I came to this country, Sir Hibbert Tupper was Minister of Marine and Fisheries, and he laid stress on the importance of imparting that kind of instruction to fishermen along the sea coast; but I soon found that the most pressing duties expected from me were those of administration, so that I soon became the head fisheries official in the Department, and had largely administrative duties, and any connection I had with the scientific or technical side was during the time which I could spare from pressing duties in the Department.

I found that fishermen were a very peculiar class among whom to carry on work of technical instruction. They are a class to themselves and are isolated and largely take the view that only a man who has been brought up in a fishing boat can know much about fish and fishing; so that those who address fishermen with a view to instructing them have to combat this strong prejudice. They have a very poor opinion of educated or expert information or knowledge.

After I came to Canada, one very important attempt was made in England in the University of Liverpool, and also in the Isle of Man, when Professor Herdman instituted a course of lectures for fishermen. He got a grant from the County Council in Lancashire of about $1,500 in a year for that scheme. When there was a Royal Commission on Fisheries Investigation in London in October, 1909, Dr. J. T. Jenkins, who was secretary of the Lancashire Fisheries Council, when asked about the result of these lectures, said "We got the fisher-

men to come to the classes and see the results of destroying immature fish, for example, and when they leave the classes they lecture to their own fellows about the subjects they have heard discussed in the lectures."

Professor Herdman and others had also been called before the Committee of the House of Commons on the Fisheries of the United Kingdom in 1907. Mr. C. P. Ogilvie, who was a member of the Sussex Board of Fishery Conservators, said that Technical Education for fishermen was desirable all along the coast, and that he would willingly give up time to help in that way, the object being to get fishermen interested in fishery investigation, and what it is doing. At present they have no interest; they do not like Government arrangements; but if interested they would co-operate. The lectures given were with a view to gathering information in the direction that was wanted in the future. The witness said he did not think the fishermen could be instructed in the direction of making them more expert, because they are tremendously conservative; they go on year after year, and will not introduce a new net or anything else until they are assured that it is going to be a success. Professor Herdman in his evidence laid stress on impressing the fishermen with the idea of returning little fishes to the sea, and he thought that would result from teaching them the life history of fishes, and that they would be inclined to stop that great waste of fish which has been going on. He said he wished the fishermen to understand what instruments like the microscope were and what such instruments accomplished in showing the nature of a fish's eggs. He said that one day in the course of the lectures they examined the egg of a fish and the young fish inside the egg showing where the egg is found and what the young fish is like. In that way they got the fishermen to appreciate the value of scientific work and to agree with their conclusions. In this way he hoped to gain their confidence and get them to help in carrying on further observations and to take the necessary steps to avoid waste of fish life in the sea. The instruction was a series of demonstrations connected with practical advice based on these demonstrations, and the men see everything for themselves and are not merely lectured.

Dealing with what may be termed the less scientific side of the matter, there have been some very practical steps taken in respect to trying to make fishermen more expert in their calling by taking young fisher boys and instructing them in the different kinds of bait they can utilise and different methods of fishing, etc. Perhaps the most important institution in that respect was the Baltimore Fishery School, which a Roman Catholic priest, Father Davis, founded on the west coast of Ireland. Baroness Burdett Coutts aided this fishery school by grants of money. I fear very much that though Father Davis accomplished some good work, the results were rather disappointing and that the fishermen in Ireland did not take up very generally the instruction given in that school.

In France over half a century ago, the great Coste, a very important scientific investigator in fishery matters, gave technical instruction to the fishermen, but there was no national system of Technical Education so far as I know.

In Germany there have been a number of experts who have laid themselves out for instructing and training men in regard to fish culture and expanding the fishery resources by utilising ponds and streams and that kind of thing. That has been largely carried on in Germany and Austria and to some extent in Italy,

where the fresh-water fisheries have been of chief importance; a fishery school exists at Venice, and lectures on fish culture are given in Rome, Milan, and Messina. But with regard to sea fisheries I do not think much very has been done.

Q.—Can you suggest any lines whereby courses of instruction could be made available to Canadian fishermen for their benefit?

In the early days of my connection with the Department of Marine and Fisheries, Sir Hibbert Tupper wished to arrange for lectures to fishermen and the public on these very matters of fish culture and the development of fishery resources; but the only way in which I have been able to carry out that is by giving at random a lecture here and there when I went down to Canso, Lunenburg, or other fishing towns; I may take lantern slides and give a lecture and thus interest the men. Apart from that, the only Technical Instruction I have been able to give is in the shape of reports appended to the Fisheries Report. I have published probably 20 or 30 of these reports; for instance, not long ago one of them was on the unutilized fishery resources of Canada, calling attention to the number of resources that are not utilized by our people.

In the U. S. there has been really no Technical Instruction to fishermen, so far as I know, in regard to curing or utilizing fish products; but there have been courses of instruction of a scientific nature on fish and fisheries at Wood's Hole, and at some other U. S. institutions. The Fisheries Bureau at Washington, though regarded by most people as a wonderful organization, carrying on its work on a very extensive and widespread scale, has really very limited lines of operation. It has absolutely no administrative and licensing or leasing duties; it does no active protective work; it is confined largely to the carrying on of hatcheries and of fish culture, and the publication of technical reports which are of great value, but which I do not think very largely reach the ordinary fishermen or fish people proper. They are appreciated by experts and by scientific men the world over; but, as compared with the Fisheries Department at Ottawa, its work is confined to one or two lines, while at Ottawa the Fisheries Department has 20 or 30 vast fields of work, especially in regard to licensing, fishing privileges and administration, the enforcement of fishery laws, prosecutions, and all that kind of thing, in regard to which the U. S. fisheries bureau is not concerned. The Boston School of Technology instructs in the utilization of fish products, oil, glue, manure, etc.

The most remarkable example of Technical Education in regard to fisheries is furnished by Japan. It has a very elaborate system. There is an Imperial Fisheries School at Tokio with five professors and four lecturers, 59 lecture rooms and living rooms, indeed quite an elaborate institution. There is also another school at Hokkaido, which includes some interesting departments. Apart from the museum and lecture rooms, it has a cannery for giving instruction in canning fish; a drier for instruction in drying fish; a glue plant for utilizing glue products; and a refrigeration department for showing how to preserve fish in cold storage. Japan really has done more than any other country in regard to that. It was founded largely through the National Fisheries Society of Japan, an organization begun in 1881 as a voluntary organization with not quite 500 members at the beginning, but with 5,000 members now. It has meetings

for discussions, and the Government submits to this voluntary society topics for discussion among its members. It also provides lectures, exhibitions, demonstrations, etc., for its members, and with aid from the Minister of Agriculture it carries on the training of young men in catching and preserving fish and in fish culture. It sends commissioners to study the fisheries in other countries. We have had many of these Japanese visitors in Canada; one was here not long ago, Dr. Kitahara, and I saw him also in Scotland enquiring into the development of the fisheries and recent methods of capturing and handling fish. They have a systematic course in Japan, leading to a diploma. It is a three years' course, and the student graduates in one of three departments—practical fishing, the preservation and marketing of fish, and the preparation of fish oils, or in fish culture. Many of the fishermen in Japan take out the students in their fishing boats, and for this they receive a bounty from the Government. That seems to be quite a good scheme—giving a bounty to fishermen to take young students out to instruct them in the working methods of fishing.

In going over the statistics of these schools, I cannot see that they are really interesting the whole of the fishing population. Where you have only a few hundreds who are trained and educated, it seems a very small number to affect tens of thousands of fishermen, and I do not know that Japan has yet carried out an elaborate scheme for trying to teach the whole of the fishing population.

Q.—How long has it been in operation?

A.—Since 1891 or a little later. I have figures for 10 years back. They must have been going on with that work for 20 years and they publish a journal of the Fisheries Society of Japan subsidized and circulated by the Government, and printed partly in English and partly in Japanese.

Q.—How long do these students attend that institute?

A.—It has a three years' course. I do not think they have any short courses at the two great schools I speak of. The men are supposed to go through a thorough course of instruction. I think it is open to anybody to go there, and then when they get this instruction, they become managers of canneries and actually enter into the industry. It really trains them for becoming directors.

Q.—What was the attendance?

A.—Ten years ago, 72 passed in fishing in one year. About 100 passed in the technical practical instruction and about 34 in the year in fish hatching and fish culture. That would mean six or seven hundred in attendance.

Q.—Would you call that an institution for higher instruction?

A.—Yes. That does not claim to teach the lower class of fishermen at all. In B.C. we have a large number of Japanese fishermen—three or four thousand of them—and these men have not been trained in that institute, but I think many of them have been directly affected by those instructors, because they come over very well qualified to carry on fishing and they are generally regarded as more expert fishermen than our own white fishermen.

In regard to other fishermen that I know, such as Scotch and Canadian, generally they are not very ready to receive instruction and you have to overcome that opposition with the practical fishermen of which I have spoken. This

has come up very prominently in many ways. I have had several schemes attempted by the Government. One was to improve the salt sea herring of Canada, which packed in barrels brought only $3 or $4 a barrel while Scotch cured herring realised from $10 to $15 a barrel. When the question was put as to why Canadian herring were so low in price and so little esteemed, it was said that they were inferior fish and that our Canadian herring are not equal to Scotch herring when in the sea; that the fresh Scotch herring is a better fish. On my suggestion to the Minister of Marine & Fisheries, it was arranged to bring out an expert curer and cooper to make barrels, and six or eight girl curers who gut the herring—what we call "gutters" in Scotland—and they were stationed at Canso and down at Clark's Harbour. They also went out to B.C. and different points. They fixed up a small curing station and put up herring. A great many fishermen went there, and saw this, and the result of the experiment was that herring quite equal to any cured herrring in the world were produced out of our Canadian herring. Good barrels of herring were put up and shipped away to New York, some to St. Petersburg, etc.

Part of our scheme was to adopt the Scotch method of following the schools of herring and capturing them at all times. In Scotland they do not wait for the herring to come close in-shore, as we do in Canada, and only catch them when they come to the nets. The Scotsmen go out after the herring,—hunt for them as it were—and after long years of experience, they know pretty well where they will meet the schools of herring, but in Canada that has still to be found out. Our fishermen have very little notion about the movements of the schools of herring at 20 or 40 miles from shore. They fix up their traps and apparatus close inshore and wait till the fish come in. The point is this; I consider our fishermen are quite expert, and perhaps some instruction as to the habits and structure of fish, even though it does not bear directly upon their actual work, would be of great benefit; that knowledge is always a good thing to have, and our fishermen really have not that knowledge at present; they have very little idea as to the conditions of fish life and the structure and habits of fish, because they have not the time and means for getting that information.

As to other practical methods of handling fish, the Dominion Government, at my suggestion, built a Whitman Patent Drier on Prince Edward Island, the object of it being to dry fish in all kinds of weather. Ordinarily fish can only be dried with favorable weather conditions; in damp and foggy weather fish will not dry out on the rocks, or on the flakes, and the consequence is that many fish spoil and inferior fish are produced by bad weather conditions. The fish drier really circulates heated dry air among the fish as they hang in the chambers. It is an admirable method of curing fish especially if already partially dried on flakes. However, it has not resulted in the adoption of fish drying sheds anywhere else. It seems when the Government started this institution, all the fishermen thought they had a right to take their fish there to be dried and they wanted the Government to do the drying for them whereas it was intended as an object-lesson only.

We have also made some attempt to ensure a permanent supply of unsalted frozen bait for fishermen on the Atlantic coast. A scheme of bait freezers was

started some time ago and a Parliamentary vote provided in 1900, but they did not succeed very well. The idea of the Fisheries Department was to start these small freezers and place them in the hands of small committees of fishermen, but fishermen are not good business men, and in almost every case the freezer was mismanaged; something happened, and it caused a great deal of trouble. Not only so, but the bait when frozen was regarded as inferior bait. I admit that the freezers in the hands of committees of fishermen were not successful; they proved a failure on account of mismanagement. For instance, fishermen relied on each other for securing their supply of ice, and there was no ice provided, while in some cases when the fishermen came in, they thought somebody else had put in the ice, and there was a lot of mismanagement. At the biological stations I put to the test the statement that frozen bait is not as good as fresh bait. Professor Knight, of Queen's University—who has done a great deal of work at our biological station gratis—carried on in Gaspé a series of experiments with frozen and fresh bait, and found that frozen bait was almost as good, and in many cases better because firmer and tougher than fresh bait; and the fishermen who went out with Prof. Knight in the boat had to admit that hooks baited with frozen bait often made a better catch than the fresh bait in a strong tidal current. There were some cases where the fresh bait made a better catch than the frozen bait, but the conclusion was that the frozen bait was cheaper and about as good as the fresh bait, and therefore fishermen need not suffer from the lack of bait if they could only rely upon a supply from the freezers. When the scheme was started, I had had experience with what we call mussel bait in Scotland, and I thought if only mussel societies there could be got up among the fishermen to supply themselves with bait, instead of paying some company high prices for bait, it would be a great advantage to them. A number of societies were founded, but there was only one case of success. They were all a failure on account of lack of business ability and of quarrels that occurred among the fishermen; they cannot run these things and someone else had to come in and run them for them. I anticipated there might be trouble among the Canadian fishermen; I said so in some of my reports to Sir Louis Davies, who was then Minister of Fisheries (1899) and I said it might come to this, that the bait freezers would have to be managed by officers of the Department.

About 10 or 12 years ago a scheme of the highest importance was approved by the Government for founding stations for investigating fish life and marine biology, and at St. Andrews, N.B., a laboratory on a scow was stationed at a selected point and then moved to other points, and gradually progressed around from St. Andrews in the Bay of Fundy to Canso and around to Prince Edward Island, and then to Gaspé and lastly to the north shore of the Gulf of St. Lawrence. In each place a number of biologists from the universities came there without salary or fee to carry on researches such as they could conduct in regard to fishes and fish life. The Government merely paid the travelling expenses of these people, and contributed also to their board. We have produced two publications and the third, which is now in hand, will embrace quite a large and elaborate series of scientific papers bearing on all kinds of subjects more or less relating to the fisheries, with a record of the biological station on the Atlantic Coast and a

similar station founded more recently on the Pacific Coast at Nanaimo on Vancouver Island, and a station on the Great Lakes and Georgian Bay. These have been quite successful, considering that they have practically no salaried workers and that you cannot get systematic and fruitful work in this field of investigation unless you have adequate salaries paid to workers. Young men in our universities cannot afford to spend some years in research merely for the fame or name of the thing; they like to be getting some salary, and we have no fund for salaries for those men to carry on scientific work; hence, there have been no salaries paid except to the curator of the station, who is usually a distinguished student of McGill or Toronto University, and he is paid because he does a lot of routine work, attends to the other workers, etc. I imagine that if some kind of scholarships could be provided, this biological work would be much more effective, as some young men would then be able to devote themselves to this work.

The Biological Board is not really encouraging technical instruction to fishermen or other people, because the research men do not like a bustle about the place, and to be crowded or disturbed by visitors. It has been really a research station, and we have had some of the very ablest workers in Canada down there, distinguished scientific men like Professors McCallum, and Ramsay Wright of Toronto, Professor Knight of Queen's, and Prof. McBride of McGill. There has been no reward except purely scientific results.

Q.—How many fish hatcheries are there?

A.—About 40 from ocean to ocean.

Q.—How are they administered; that is, are the men in charge technically trained?

A.—They were for a time under my charge, and I found that the officers in charge of these hatcheries were largely men who had been trained under a self-taught man, Mr. Samuel Wilmot, who was an enthusiast and a very rare type of man. He had no scientific knowledge and many things that he did appeared to a scientific man a little mistaken, but he was an enthusiast and he certainly had a lot of men taken from farms and elsewhere, who became enthusiasts also, and they were the best officers we had. Most of them are old men now, and are dropping out. Mr. Wilmot's staff was one such as is very rarely secured. As they dropped out, of course appointments were made of various kinds, and not always satisfactory to the service, and at present quite a number of hatcheries are no doubt in the hands of men who are really learning the business, which is a very serious disadvantage. We have no actual training of fish culture officers at all.

Q.—Is there any reason why there should not be a school or other means for the training of people to take charge; that is a form of technical instruction suited to their needs and the needs of the public service?

A.—I consider that the training of hatchery officers is really one of the most essential things possible; but of course appointments are made by Government, of an urgent nature, I suppose, and the men who are appointed have not time or inclination to take any training at all. Anybody can see that such delicate processes as breeding young fish and taking care of them is a scientific matter.

Q.—Having a man of average intelligence, with probably a High School general education, what institutional course would be necessary to enable such a man to be competent and qualified to be a fish hatchery officer and manager?

A.—I think any intelligent man could be sent to a good hatchery and learn the practical process; and if some means were taken to give technical instruction also a man could be trained I think in 9 or 10 months to be qualified to take charge. I say 9 or 10 months, because that would cover the taking of the eggs and the incubation of them.

Q.—In the organization of a hatchery, would it be difficult to have one hatchery expert and retain two or three or four such learners?

A.—It would be quite easy for half a dozen learners to be accommodated in a hatchery.

Q.—Would they be able to give sufficient service to make their services worth any wages?

A.—No; they would be required to do work for a very low rate of pay; it would not really be a salary. They could get their living.

Q.—Would the scientific instruction necessary consume a great deal of time, or could a good deal be done by a course of reading and occasional visits? For instance, if there were four or five hatcheries with a number of learners in each, could a travelling scientific and practical instructor meet the situation?

A.—Yes, that would be quite possible. He could travel round from one to the other. It could not be done solely by reading books. The feeling often in our hatcheries is that there are so few of our officers who realise what an ovum or egg really is; and Members of Parliament, who speak about them, speak of them as they would of peas or vegetables, and especially the public, forgetting that ova and young fish are more in the nature of young, tender infants that have to be carefully treated and cared for. In regard to planting, the same applies—if you placed a whole lot of tender children in a frozen waste, people would think it very foolish. People often speak as though young fish could be planted out in any place where a Member of Parliament wishes. The wonder is that fish culture is doing such good service. The fact is that our hatcheries are doing very good work. I do not think the U.S. has any more zealous officers or any better. I think that these early officers trained under Mr. Wilmot were quite equal and ahead of most of the U.S. officers. I do not think we have anything to learn from the U.S. in regard to the actual practical operation of a hatchery.

I have just returned from the great Fisheries Congress at Rome and looking over the program again, I am struck by the fact that there is not any such thing mentioned in that International Congress as instruction to fishermen, or any training in fishing at all. It is a matter to which very little attention has been given in most countries. I noticed the same at the previous Congress in Washington and St. Petersburg; there were no papers on the training of fishermen or of fish culture officers. The only paper on training hatchery officers was one I read at the Washington Fishery Congress, September 24, 1908. In other words, it seems to be taken for granted that the fisherman knows the practical part of his business.

Q.—Is there anything in the hunting of fish to be learned from testing temperatures of water—getting plotted areas as to where certain temperatures might prevail at certain periods?

A.—The attempt is being made to plot out the North Sea in that way. I am prepared to await the official results of the work that is going on. In the meantime I am rather of the opinion that there is not enough regularity in the conditions of the sea to make it a practically reliable method of going about the fishing. I know that in Norway some years ago it was said a man could find out the schools of fish (herring) by testing the temperature. Some experiments in regard to temperatures carried on in the Gulf of St. Lawrence show that there is quite a good deal of erratic character about some of the temperatures and I fancy the movements of the fish will be a little erratic on that account, and that so far as we know at present the only reliable grounds for expecting fish in a certain locality is that the fish are accustomed to school in certain places for feeding or for spawning and that may involve conditions of temperature there; but when the fish are about to spawn on the Labrador coast, for instance, we know where fish gather for spawning, and there the fishermen make their good catches. On Prince Edward Island fish come for spawning, and they also feed on the small life at the surface of the sea. These two facts,—spawning and feeding—depend on conditions of temperature; but I regard the fishermen's calling as depending rather upon his observing whether certain food is about, than testing it by temperatures. For instance, on the Labrador coast, when the schools of capelin come in, then the fishermen operate because where the capelin are, the cod follow. A good deal of scientific work has been done and conclusions have been drawn which I think are rather premature. One Danish observer has told us how much per cubic mile of fish you may expect in the sea, and that kind of thing, which cannot possibly in the long run be borne out. I have been reading over the reports of the International North Sea Fish Investigations of the most elaborate nature, but I consider that perhaps the fisheries will not receive the benefit from some of these investigations that is anticipated by many. I consider that fishery research in the sea and practical fisheries are two separate departments, and one may or may not give light to the other; it may relate to facts which are of interest in themselves but without interest to the fishermen practically.

Q.—There is another field of investigation, in regard to the protection or improvement or extension of existing oyster beds and also as to the feasibility of seeding down or otherwise laying out oyster beds in areas not at present occupied profitably with that fish; is there any need for technical instruction in connection with that?

A.—In the U.S. they have really solved that problem. Chesapeake Bay is a model of what can be done in encouraging culture. We have Mr. Ernest Kemp, who was brought out from Whitstable, England, many years ago to improve our oyster fisheries in Canada, and he has been a hard-working officer and has done a great deal to clean various beds, and work upon them and prepare areas in certain localities, but the result of his labors has been largely nullified by this fact, that oyster beds can not be leased to private parties, and without such

leases it is not worth their while to spend money and time upon them, and oyster culture can never be carried on. The cultivation of public oyster beds which are open to everybody that likes to fish, renders hopeless any attempt to improve the oysters. That has been the initial difficulty in Canada—the public claim that they have a right to these beds, and the Government do not appear yet to have taken the matter adequately in hand.

The beds produce some values, but 10 times or 100 times more might be obtained, provided they were looked after properly.

There is another disastrous feature—the mussel mud digging. Farmers all claim that they can dig fertilising material from the beds and a great many of the farmers in P. E. I. claim that as a right. Still, I think that the oyster industry is of such tremendous value and importance that the question of taking over these areas and of getting over the difficulty of alleged mussel mud rights and dividing the beds out as much as possible among the residents along the shore and giving them leased areas, is a solution which will have to be reached some day. There is no other solution for it. If the Government could show how much benefit it was going to be to the residents, they would get their support in the matter and an increased supply of oysters in Canada would be a public gain, especially if lower prices followed.

When I was first connected with the Fisheries Department, we thought the Dominion had property rights to these beds and we issued leases for 9 years. At the end of 9 years they terminated. These leases worked very well. There is no doubt the people spent money and time on these areas which they had leased for 9 years. The oyster reaches its maturity in three years, so that a man will have three harvests before his lease expires. When it was found that the Dominion Government had no well-defined rights in the matter, that all it could do was to make regulations for the Provinces to enforce, then the end came to any system of preservation of the beds. We have fishery laws now, a man cannot sell an oyster under a certain size and can only fish at certain seasons; and these regulations are good, but as in the case of the Shediac oyster bed, prepared during several years by Mr. Kemp, the Department's expert, at the conclusion of the period of preparation, the whole of the inhabitants went in and in three days undid the whole work of many years. They got oyster licenses. The Minister of Marine and Fisheries was passing through Shediac at the time and was aghast at seeing the immense number of barrels of oysters waiting to be shipped from Shediac. The Government, as a matter of fact, had prepared the harvest to be immediately utilized by the local people. If, on the other hand, that could have been leased after it had been prepared, and a fee paid upon it, there might have been nine or ten people interested in that lease, and they would not have destroyed the beds, but taken off a good proportion of oysters and kept the beds in good order for the future. These details are really administrative matters, but that is where the crux lies—the difficulty of encouraging cultivation where you cannot give an exclusive lease or right.

Q.—Has your Department taken any steps to instruct the fishermen in Navigation and aids to Navigation, etc.?

A.—Yes. There have been a number of courses given in various towns in the Maritime Provinces and on the Lakes, at Kingston and other places, under Capt. Demers, who had charge of instruction in nautical matters and navigation; a lot of apparatus was provided to illustrate these lectures, but I do not think they were as largely taken advantage of by the fishing population as was expected—I am speaking now without full official knowledge. The instruction in navigation and nautical matters was a distinct branch of work carried on for several years. I think it has been given up to some extent now.

Q.—We were told that the Provincial Department of Technical Education in Halifax were giving instruction to the fishermen in the use of gasoline engines as an adjunct to their sail-boats and also that the principles of a submarine telephone were being explained to some of these men; has your department ever taken any interest in bringing these things to the attention of the fishermen?

A.—No. I do not think that the Dominion Government Department has taken any interest in teaching the management of gasoline launches and those matters. Gasoline launches have been very largely adopted recently, but whether that was the result of Technical Instruction or not, I do not know.

SECTION 4: THE FISHERY BOARD FOR SCOTLAND.

The Commission had an interview with Mr. Angus Sutherland, Chairman of the Fishery Board for Scotland. From his statements, as well as the official reports of the Board, it is evident that the Fishery Board has been a powerful influence in the development of the fishery interests of Scotland and in bringing the industry to its present state of acknowledged superiority. In this connection it is more than interesting to observe that the Scottish Board, although considered everywhere as perhaps the most advanced and best organized body for public service in fishery affairs, is more than willing to learn from what other countries have done and are doing. At about the time of the Commission's visit, a Committee of Enquiry was appointed for the following purposes:—

The North Sea Fisheries.

The Secretary for Scotland has appointed the following gentlemen—

Mr. Angus Sutherland, Chairman of the Fishery Board for Scotland (chairman);

Mr. J. E. Sutherland, M.P., for Elgin Burghs;

Mr. H. M. Conacher, Scottish Office;

Dr. T. Wemyss Fulton, Scientific Superintendent to the Fishery Board; and,

Mr. James Moffatt, of the Scottish Education Department—

to be a Committee to inquire into and report upon,—

The character and national importance of the inshore and deep-sea fisheries of Norway and other countries engaged in the North sea fisheries, and the

efforts made for the development of the fishing and fish-curing industry in all branches including,—

(1) The systems of fishery administration, including the constitution and function of the local committees formed for this purpose in Norway, and of any similar organizations in the other countries;

(2) The facilities provided for research and for educating and training those engaged in these industries by the establishment of technical schools, museums, laboratories, classes, or other special facilities;

(3) The nature of the various means of capture employed, and the methods (including any use of State credit) by which fishermen obtain the necessary capital to maintain the efficiency of their vessels and equipment;

And to report in regard to each of the foregoing matters whether it would be advisable for similar action to be taken, with or without modifications, in the case of the Scottish fishing industry, and, if so, what means should be adopted.

SECTION 5 : STATEMENT BY DR. T. WEMYSS FULTON.

The Commission had the advantage of "Conversation" with Dr. T. Wemyss Fulton, who in addition to being the Scientific Superintendent to the Fishery Board for Scotland is recognized as one of the leading authorities on fishery questions in Europe. The important points in the wide range of information furnished by Dr. Fulton are as follows:—

Fishery schools exist in practically all European maritime countries—France, Germany, Belgium, the Netherlands, Denmark, Norway, Sweden, Spain, while by far the best and most thoroughly organised are in Japan. Their scope is varied and in most cases they aim at the instruction of fishermen or those directly concerned with the fishery industry.

FRANCE.

Some years ago, with the concurrence of the Minister of Public Education, a course of instruction in fisheries and fish-culture was established in the primary schools along the coast—over 400 such courses being provided. This was in addition to the fishery schools proper, of which a dozen or more exist. Several of these are under the Société de l'Enseignement Professionnel et Technique de Pêche, a society which supervises fishery education, the establishment of fishery museums, conferences, exhibitions, etc. The program of a school is adapted to the requirements of the district in which it is situated, but always includes certain subjects prescribed by the Minister of Marine, as the navigation and landmarks, etc., of the district, the fitting up of rigging and fishing-gear, the principles of health and social economy, the methods of preserving fish, and fishery regulations.

Schools which receive the patronage of a Chamber of Commerce get a subvention from the Ministry. They are administered partly by local societies and partly by a constituted body. Those at Marseilles and Sables d'Olonne are municipal; those at Rochelle, d'Arcachon, Groix, and Phillippeville are under

local societies, while at Fecamp and Dieppe they are under the Chambers of Commerce. At Boulogne-sur-mer the school is associated with the Station Aquicole (a government institution) and is attended by men from Dunkirk, Gravelines, etc., who are taught such subjects as navigation, fishing grounds, the methods of preserving fish, the use of fishing appliances, etc. An old government vessel is used as a floating school. Various researches on the application of science to fisheries are carried on. The Marseilles school has attached to it a most complete museum, containing models of fishing vessels, fishing gear of all kinds, and from various countries; models; photographs illustrating methods of fishing; charts and instruments used in navigation; collections of fish, crustacea, baits; and various fish products, as isinglass, manures, glues, as well as marine algae. Lectures and demonstrations are given.

BELGIUM.

Schools exist at Nieuport, Blankenberg and Ostend. The last named is most important, and possesses a "teaching vessel," where pupils are trained. There is also an experimental laboratory where various researches are made, as, for example, the barking or curing of nets, the best oils for preserving fish, etc.

THE NETHERLANDS.

The number of schools is increasing—as indeed is the case in most countries They now exist at Ijmuiden, (where the expenditure in 1908 was 8,393 florins and where there are two "school ships" lent by the Department of Marine), Vlaardingen, Maassluis, Scheveningen, Noordwijk, Enkhuisen, Marken, Volendam. The schools are attended, chiefly in the winter, by lads from 12 years old and upwards as well as by men.

The subjects taught are navigation, the determination of latitude and longitude, distances, courses, charts, the coasts and banks of the North Sea, fishing grounds, and some more purely fishery subjects.

A few years ago the Society for the Promotion of the Fisheries of the Netherlands petitioned that the government should so modify the law as to enable fishery instruction to be included in the primary schools at fishing places.

NORWAY.

Special attention is given by various local societies, which receive State aid, to fishery education, partly by schools or school-ships (Trondhjem) and partly by sending delegated fishermen to other districts or to foreign countries for instruction.

There are schools at Bodo, Vardo, Christianssund, and at some other places. Fishery museums have been established at Bergen, Bodo and Trondhjem, and at the experimental stations at Bergen and Trondhjem such subjects are investigated as the preservation of fish, fungoid growths on dried cod, the chemical changes in pickled fish, the production of oil, new kinds of tinned fish products, etc. There are competitions and prizes.

SWEDEN.

There is at least one fishery school in Bohuslan, chiefly to teach navigation in connection with the North Sea banks, and especially around the Shetlands.

GERMANY.

There are quite a number of schools under the Sea Fishery Association, a semi-official organization, partly on the North Sea coast and partly on the Baltic. The main instruction is in navigation, fishing grounds, methods, etc. The Association publishes annually an instructive "Almanac" for the use of fishermen; it is a volume containing a great deal of varied information. At Altona there is a large and beautifully arranged fishery museum, in which are shown among other things, models of the actual fishing operations. In Germany popular courses of lectures and demonstrations are often given in regard to fisheries, and include instruction as to the cooking of fish.

JAPAN.

It is in Japan that the greatest and best organized efforts are made in connection with fishery education. The chief institution is the Imperial Fisheries Institute (Susian Koshujio) at Tokyo. It aims at educating the young Japanese in everything pertaining to the fisheries, as well as in carrying on a great variety of investigations, not only on the natural history of fishes, but in the preparation and curing of fish, fish-culture, and, in short, on everything relating to the fisheries. A few years ago the government expended £17,000 ($85,000) for a new building for the Institute, which has several vessels and fishing boats attached to it. There are two lecture rooms for general use, and other lecture rooms and laboratories for pisciculture, chemistry, biology, fisheries technology, as well as museum, library, and cold storage rooms. There are three courses of study: (1) in connection with the department of fishing, (2) the department of pisciculture, (3) the department of fisheries technology. In the first the pupils receive a practical training in all the arts and methods of fishing; in the second, in the various processes of fish-culture; and in the third in the methods of preparing all kinds of fishes, shellfishes, seaweeds, etc., for the market.

There are about a dozen stations for fishery instruction in the neighbourhood of Tokyo—one, for example, to teach the methods of preserving, curing, and canning fish; another for the management of boats, gear, etc. The students from the schools and the lecturers visit various parts of the coast and arrange for instruction as required; usually two or three of them are in Scotland every summer.

ENGLAND AND SCOTLAND.

Courses of instruction for fishermen are carried on at Aberdeen and at Lancashire, the former under the Fishery Board for Scotland, the latter under the Lancashire Sea Fisheries Committee. There is also a Lectureship at the

University of Aberdeen on the Scientific Study of Fishery Problems consisting of six lectures annually to the advanced students of Zoology, but open also to the public.

COURSES FOR SCHOOLS.

The following scheme was suggested by Dr. Fulton as being suitable for fishery instruction in general schools in communities of fishing folk.

1. *Historical and Commercial.*

An historical introductory sketch might be given, which should include the relation of the fisheries to the settlements, etc., and be illustrated by maps and if possible by lantern slides, showing the countries from which the fishermen came, the length of the voyage, the reason for journeying so far in those early times for fish, the great abundance of cod fish, the demand in Catholic Europe for fish in Lent and on fasting days.

Then the great commerce in the products of the fisheries and what is brought in in return, the export of the staple product to foreign parts, chiefly consumed by the Latin races in Europe—Portugal, Italy, Spain—and in South America —Brazil—contrasting with the preference for pickled herrings among the Teutonic races and the Russians.

Cod: oil cod roes used for bait in the sardine fishery.

Herrings: frozen and pickled — chiefly to the United States, and West Indies.

Lobsters: chiefly to the United Kingdom and Europe.

Seals: oil and skins. Whale oil.

2. *The Fishery Industry.*

The situation of the fishing grounds.

Topography: depths, relation to currents, temperatures.

The fish caught: codfish, herring, lobsters, halibut, seals.

Methods of fishing: lines, trawls, hand-lines, baits, seines, traps, drift-nets. Otter-trawling (as by French). Sealing.

How the products are prepared for market: heading, splitting, salting, washing, drying, artificial drying for cod, smoking, pickling.

The scientific basis of fish-preservation: methods used, tinning oils, etc.

How put on the market: statistics of the fishery industry.

3. *The Natural History of Fish.*

Simple lessons on the structure of fishes, say, a codfish or a flounder (or halibut); the osseous system; the blood, heart and gills; circulation; the breathing of fishes by the gills; composition of the air; air dissolved in water (may be accompanied by simple experiments); the fins.

Generation of fishes: viviparous forms, ovoviviparous, oviparous. The soft roe or milt; the hard roe or ovaries. The spawning season; the spawning places. The eggs—various kinds—demersal or bottom, adhesive, as herring; pelagic or floating, as cod, halibut and most commercial fishes. Fishes that

guard their eggs—by carrying them, as in mouth, by constructing nests, usually the male; examples. The fertilization of the egg-development of the embryonic fish; influence of temperature on the rate of development, duration, hatching. General characters of larval fishes, the transformation of flatfishes.

Fecundity of fishes: cod, ling, turbot, eel, many of which produce millions; herring, 20,000 to 30,000. Great destruction in nature.

The food of fishes: the minute floating life in the sea (plankton); herring lives on this chiefly; cod on crustacea and fish; ling, turbot, brill, John Dory, etc., almost only on fish. Primary source of food is plant life, especially the minute floating plants (phytoplankton); invertebrates and larval forms live on this and fishes on them in turn. Vegetable feeders very rare.

The growth of fishes: how investigated; keeping in tanks, marking experiments, study of hard structures, "rings" in ear-bones, scales and bones, as vertebræ, caused by intermittent growth, as with trees. Rate of growth, influence of temperature, growth slow or arrested in winter, rapid in summer.

Age of fishes: herrings may reach 15 years and over; also cod, plaice, 25 years. Size and age at sexual maturity varies in different species and in the two sexes. Immature or undersized fish and their protection. Protection of breeding fishes.

The migrations of fishes: different kinds, irregular wanderings and definite migrations, relation to feeding and reproduction, certain examples of known migrations—anchovy in a season migrates over 1,000 miles in Europe; salmon in rivers of Alaska and British Columbia; eels migrate to the depths of Atlantic; determination by marking experiments; cod in America, Iceland, etc; plaice in North Sea; movement against currents, reasons for; rate of movement determined in certain cases; migration of crabs and lobsters—may go 100 miles and more.

4. *Fishery Legislation and Regulation.*

The problems of overfishing and impoverishment of grounds; importance of scientific statistics. The reasons for close-times. The action of certain apparatus in relation to immature or breeding fishes—seines, otter-trawls, lines, trap-nets. All regulation should be based on knowledge of fishes. The question of pisciculture—fishes, shell-fish.

SECTION 6: SCHOOLS FOR FISHERMEN IN ENGLAND.

It has been already mentioned elsewhere in this Report that the Commission had the advantage of being accompanied during part of its enquiries in Europe by Professor Frederic H. Sexton, Director of Technical Education and Principal of the Technical College of Nova Scotia. Professor Sexton, in company with members of the Commission, and also by himself, paid special attention to the provisions for the education of miners and fishermen. He made a full report, as published in the Annual Report of the Superintendent of Education for Nova Scotia (1911.).

As the portion of that Report on *Schools for Fishermen*, which extends to 56 pages, contains in well arranged form substantially the information gathered

by the Commission by visits to the schools described, supplemented by enquiries and investigations carried on by Professor Sexton, the Commission, with his consent, avails itself of the arrangement of some of the material from official sources as prepared by him.

Apprenticeship is Disappearing.

The system of regular apprenticeship of boys in the fishing industry has almost altogether disappeared. It is more or less of an unwritten law among trawlers that boys will not be taken on until they are 16 years of age. As is often the case in all industrial centres the boys leave school at the age of 14 years and engage in casual, unskilled labor for the intervening two years to the detriment of the modicum of knowledge they have already acquired and their habits of thrift and industry. In the fish markets they do all sorts of odd jobs on "the stage," as the fish wharf is called. In Hull there are between 80 and 100 boys under 16 who are given intermittent employment on "the stage" between the hours of 7 in the forenoon, and 1 o'clock. very few of whom will attend a technical school for fishermen in the afternoon or evening. The apprentice is supposed to serve a period of 5 years (from 16 to 21). He gets no wage during that period, but is supplied with a good uniform and gets a little spending money each time he returns from a voyage. The attention which he receives from the officers or crew on board in the way of instruction is generally of an indifferent character.

Fifteen Technical Schools.

Following is a list of the communities in England where some instruction is given in navigation, Seamanship, Netmaking and Mending or some other subject pertaining to the fishing industry. Hull, Grimsby, Kings Lynn, Winterton, and Wheatacre in Norfolk Co.; three schools in Great Yarmouth; Lowestoft, Oulton Road, Upper Kessingland, and Carlton Colville in East Suffolk Co.; Fleetwood, Morecambe, and the Piel Marine Laboratory at Barrow-in-Furness.

At the last mentioned place lectures and laboratory demonstrations, as well as instruction in navigation, are given to fishermen in a short course lasting two weeks and taking the full time every day. This is the only place in England where they give courses dealing with the life history of fish. In the earlier days of the school at Hull, the head of the school attempted something more or less elaborate along this line, but dropped it after a fair trial because he could not find any interest in this subject among his pupils. The two schools at Hull and Grimsby are by far the most important in England. The school at Grimsby will be described more or less in detail.

(1) GRIMSBY TECHNICAL SCHOOL FOR FISHERMEN.

Grimsby, the greatest fishing port in the world, is a city of about 100,000 people and almost entirely dependent on the fishing industry. There are about 5,000 men engaged in trawling who are residents of Grimsby, a somewhat

greater number than reside at Hull. The active development of the fishing industry here is due in a great measure to the enterprise of the Great Central Railway. The railway owns the fish docks, the locks, the market lines of steamers to the different ports of Hamburg, Antwerp, etc., and thus completely controls the situation.

The apprenticeship system obtains at Grimsby, and there are about 150 apprentices on the trawlers sailing from Grimsby. Seventy per cent. of these attend the technical school for fishermen, but are under no compulsion to do so.

The school was opened in 1907 under the Grimsby Education Committee.

EQUIPMENT.

The equipment is simple and efficient for the work, but meagre compared with some other Navigation Schools visited in Scotland and on the Continent. The principal of the school has developed some very ingenious apparatus to illustrate some of the more difficult parts of the instruction. Among these was an annunciator board with different colored spots and connecting electric circuits so that any combination of ship's lights could be thrown on the board in order that the student who stood at the other end of the table with a small steering wheel on a model boat could learn the proper duties of steersman.

COURSES.

According to the leaflet issued by the school the courses are given every week day except Saturday from 2 p.m. to 9 p.m. and are as follows:—Use of Sextant and Adjustments. Use of Charts. Logarithms. Traverse Sailing. Parallel Sailing. Current Sailing. Mercator's Sailing. Latitude by Observation of Sun, Moon and Star. Longitude by Observation of Sun or Star. Position by Sumner's Method. Position by Johnston's Method. Latitude by Ex-Meridian Altitudes. Compass Correcting by Amplitude and Azimuth. Tides and Reductions of Soundings. Ocean Currents. Great Circle Sailing. Coast Line Drawing. Definitions of Nautical Astronomy. Rule of Road, Sail and Steam. Lead and Log Line. Hand Flag Signalling. Night Signalling. Morse Code. Breakdowns, Stranding. Jury Rudders, Collisions. Rocket and Mortar Apparatus. Variation and Deviation of Compass. Use of Deviascope. Rules and Manoeuvres in Docks. River Buoyage, Courses and Distances. Netmaking, Splicing, Knots, Bends, Serving, Marling, etc. Seamanship, etc., etc.

Room No. 1 has been specially fitted for deck hands and apprentices, and contains a large model of the river, showing the buoys, lightships, shoals, courses and distances, and approaches to docks.

The subjects include Rule of Road, Use of Charts, Use of Sextant, Hand Flag Signalling, Netmaking, Knotting, Splicing, Serving, etc., Map Drawing, Dock Manoeuvres, and any subjects in navigation desired.

Room No. 2 is for the use of the captains and mates. A full or part course of navigation can be entered on.

All nautical books, charts, instruments, writing and drawing material are provided free.

Room No. 3 has been fitted up for Netmaking and Mending.

Members of the trade have kindly promised prizes, consisting of Sextants, Watches, Binoculars, Nautical Books, etc., which are presented to those who show the most marked ability at the end of each term.

The books, charts and instruments are at the disposal of any Master or Mate, and the instructor is pleased to give advice on any nautical matter.

Courses are also offered three afternoons a week in steam and marine engineering for those who are qualifying for Board of Trade certificates as engineers.

Attendance.

The attendance in navigation, seamanship and netmaking was about 750 the first year the school opened, 900 the second year, 850 the third year, and about 850 the present year, 1911. Of these, the larger number (450) take the class in navigation, and the rest (400) take net making. A few (50 or 60) take both sections of work. About 250 men attend the classes in steam engineering. The attendance makes this school easily the largest technical school for fishermen in Great Britain.

Of the men who attend not over a dozen are present more than the maximum of 160 hours a year set for a basis of grants by the Imperial Treasury. About forty per cent of those on the roll attend less than the minimum of 14 hours a year set by the same authority.

Instructing Staff.

There are three instructors:—

The headmaster and instructor in navigation, nautical astronomy, rule of the road, etc., has had a long experience as master on steam trawlers and other steam vessels for many years.

The instructor in net-making, knots, splices, etc., has also had a long practical experience at sea as master and is an expert in his work.

The instructor in steam engineering is a consulting engineer and at one time was engineer in charge of all the steamship lines of the Great Central Railway.

Cost.

The total expenses of the school are about £600 a year. Of this amount about £500 a year is granted from the Imperial Treasury, leaving only £100 for the Borough of Grimsby to appropriate.

The basis of the grant from the Imperial Treasury for instruction in navigation is 7s. 6d. for every 20 hours that a student attends a class and 3s. 6d. for every 20 hours in Steam Engineering up to a maximum of 160 hours for any one student in one year.

(2) PIEL MARINE LABORATORY.

Following is a general outline of the courses offered to fishermen by the Piel Marine Laboratory (near Barrow-in-Furness).

One class for fishermen will be held during the spring of 1912. This class will be conducted by the Lancashire and Western Sea Fisheries Joint Committee and by the Education Committee of the Lancashire County Council, and is open to fishermen resident in the Administrative County of Lancaster.

FIRST DAY.

Introductory Lesson.

Some little practice is required in using the microscope and dissecting instruments. During the first day students are enrolled and common objects will be examined miscroscopically, so as to practise the students in the use of the instruments.

SECOND DAY.

The Mussel.

The following points will be considered:—

1. The general structure of the mussel.
2. The feeding of the mussel.
3. The breathing of the mussel.
4. The reproduction of the mussel.

Chemistry of the atmosphere and sea water. The air. Oxygen. Nitrogen. Carbonic acid gas. Sea water. Pure water.

THIRD DAY.

The Whiting or Haddock.

The structure of the fish. The digestive organs.

Reproduction of fishes.

The male fish. The female fish. Fertilisation. Fecundity of common fishes. The time of incubation.

FOURTH DAY.

The Food in the Sea.

Diatoms; peridinians; noctiluca; copepods; larval crabs; other larva shellfish; young fishes and fish eggs. The plankton as food for fishes. Differences between plants and animals.

FIFTH DAY.

Diatom ooze; globigerina ooze; deep sea soundings; the temperature of the sea; the use of thermometers; the saltiness of the sea; deep sea trawling and dredging.

SIXTH DAY.

Shrimps, crabs and lobsters.
Structure of the shrimp; male and female shrimps; spawning.
The crab.
Differences between male and female.
The lobster.
Differences between male and female; casting of shrimps, crabs and lobsters.

SEVENTH DAY.

The structure of fishes continued.
The skate, rays and dogfishes.
Sense-organs of fishes; electric and sting-rays; breeding in skates, rays and dogfishes.

EIGHTH DAY.

The structure and life histories of fishes.
Plaice and other flukes.
Mature and immature flukes. Plaice. Dabs. Flounders. Age of plaice in the Irish Sea. Size and weight of plaice; weight of Irish Sea plaice; sizes at which fishes spawn for the first time; the sole and solenette; times of the year when fish spawn.

NINTH DAY.

Circulation of the blood in fishes.
The mussel, cockle and other shellfish.
Eyes; groats; the "Moss"; clams.
Spawning of shellfish.
Male and female cockles and mussels.
Other edible shellfish.
The clam, scallop (or queen), horse-mussel, spiny, cockle and razor-fish.

TENTH DAY.

Development and transformation of flukes.
Different kinds of spawn found on the shore.
Worm spawn; whelk spawn; dog-whelk spawn; sea-slug spawn; spawn of the hen-fish; shell-fish spawn and cuttlefish spawn; fish spawn.
Jelly fishes.
Star fishes and sea urchins.
Lesson on collecting specimens.

NATURE OF INSTRUCTION.

The instruction given relates to general marine biology, so far as it concerns sea fisheries. The structure of fishes and other useful marine animals,

their manner of breeding and feeding, their growth and their habits, are explained. Each fisherman selected is allowed the use of a microscope and dissecting tools, and examines everything for himself. Simple chemical experiments illustrating the breathing of animals are shown. Lantern slides illustrating various particulars dealt with in the course of instruction are shown by the limelight lantern.

The instruction given is practical, and the fishes and other animals studied are examined by the fishermen. Each man is provided with a microscope, a magnifying glass, glass slides and cover glasses, dissecting dishes, and a set of dissecting instruments—a knife, forceps, scissors and needles.

As a rule, each fish studied forms the subject of a separate lesson. Two lessons are given each day except on Saturdays.

ALLOWANCE.

Each fisherman selected is given an allowance of £5 to pay his expenses and to make up for the loss of his fortnight's work, provided his attendance is regular and his conduct good. This scholarship allowance is paid in two instalments, half at the end of the first week, and the balance at the end of the second week.

SECTION 7: SCHOOL FOR FISHERMEN IN SCOTLAND.

In Scotland the greater part of the deep sea fishing is carried on by steam trawlers, as in England. The fishing smack is rapidly disappearing. The centre of the steam trawling business is Aberdeen. There is a growing tendency in the smaller ports for co-operative ownership and operation of steam trawlers. A number of fishermen club together and buy a trawler, which will cost them from $4,000 to $6,000 for a 200 to 250 ton vessel. They operate the boat on shares, the owners often constituting part of the crew. The great advantage of the steam trawler over the sailing vessel is the greater power of catching fish per man employed, the enlarged sphere of operation, and the fact that the men can practically work all the year round.

The herring industry in Scotland is also one of considerable proportions. These herring are famous the world over. At present with the steam vessels the fishermen follow the fish along the coast wherever they migrate, and thus fish almost continuously for 9 or 10 months, where they used to have only 4 or 5 months' fishing. The fishermen sell their catches to curers, who move along from place to place with the boats. Most of the preparation of the fish is done by Scotch lassies, who follow this special line of work for 5 or 10 years before marriage. Regular living quarters are provided for the girls in the different places, and they live under very comfortable and favorable circumstances.

A great many herring and other fish are cured and canned continuously in large establishments in Aberdeen and elsewhere. This work is also done mainly by girls. There is no regular apprenticeship in the business of curing. Young girls of 14, 15 or 16 years of age are taken on to do the more unskilled work and are promoted to better positions as they show capacity and as vacancies

occur. The work is all more or less of a routine character, and there is not very much for any single individual worker to learn. The intimate knowledge of the whole process is possessed only by a few foremen. From the general robust appearance of the girls, the work seems to be congenial.

Fish Hatchery, Aberdeen.

The Fish Hatchery at Aberdeen is under the administration and control of the Fishery Board for Scotland, whose offices are in Edinburgh. The hatchery is under the direction of Dr. T. Weymss Fulton and provides a short course in marine biology for fishermen under the instruction of Dr. Williamson, assistant to Dr. Fulton.

This course was started about 1905. It lasts for one week full time in the winter of each year. Thirty or thirty-five men from all along the coast and from Shetland are sent from the fishing centres to take the course. They are practically all mates or masters of fishing vessels. The County Councils in the respective centres select the men, pay all their expenses of transportation and board and give each man about £1 a week for his time. There is no tuition charge made for the classes.

The instruction consists of lectures and laboratory demonstrations from 9 to 12 each morning, and excursions to the artificial ice plants, curing establisments and other points of concern to the fishermen in the afternoons.

The plaice is taken first as a type fish. The eggs are first fertilized and then the evolution of the fish is shown by preserved specimens illustrating the different stages. The question of fecundity and rate of growth is dwelt upon to a considerable extent, especially in connection with herring, and all the points illustrated by eggs and fry. Other fish are studied, also the lobster, crab and mussel. The microscope is used constantly in all this work.

Other subjects dealt with are the chemistry of water, the digestion, circulation of fishes; the tanning of nets; the putrefaction of fish; elementary bacteriology, etc.

SECTION 8: SCHOOLS FOR FISHERMEN IN FRANCE.

These schools of vocational and technical instruction in maritime fisheries are of recent formation. They were founded with the help of gifts from private individuals or grants made by the municipalities and by the State under the auspices and patronage of the Boards of Trade of their locality and of the Society for Professional and Technical Instruction in Maritime Fisheries, whose office is at 97 Boulevard de Port-Royal, Paris.

Their aim is to raise the level of education of marine fishermen from a technical and vocational point of view, to improve the conditions of their existence, to enable them with the aid of their new acquirements to render their work more productive, so as to be able to save and thus prepare themselves against sickness, accidents, and old age; and, finally, to reduce the number of personal accidents, which are so frequent in their calling.

The courses and lectures are attended by pilots, masters of fishing boats, sailors, ship-boys and teachers. They are free, and are open to all enlisted naval men.

The schools at present open are those at Boulogne-sur-Mer, Dieppe, Fécamp, Concarneau, Groix, Le Croisic, Les Sables-d'Olonne, and Arcachon.

Other schools of the same character are in process of formation. Elementary courses of instruction in navigation have been established in the primary schools at Trouville, Villerville and Honfleur. Adult courses have been opened at Tréport and at St. Valery-en-Caux.

Those fishing schools whose establishment was brought about by the Society obtained subsidies from the Marine Department.

The importance of instruction in sea fishing has not escaped the attention of the Minister of Public Instruction and by a decree of September 20, 1898, it was decided, that, in certain elementary schools on the sea-coast, lessons would be given in matters pertaining to seamanship and fishing, according to the following program.

I. INTERMEDIATE COURSE.

1st. *The trade and things:*

Various advantages of the fishermen's calling: personal interest and national interest (familiar talks); naval enlistment; rudiments of hygiene, diet, clothing etc., necessity of swimming; sea fishing, deep sea fishing and coastal fishing; navigation; ocean travel and coasting; description of a local fishing boat (inspection of a boat and a lifeboat); definitions and use of the various parts of the boat; different kinds of ships, brigs, schooners, sloops, etc.; port, its different parts; nautical terms; the ordinary nautical words of the English language; foreign flags.

2nd. *Practical rudiments of seamanship:* practical astronomy, constellations, polar star, apparent movement of the sun, inequality of days and nights; equinoxes; the moon and its phases; the sea tides, flood-tides, ebb-tides, almanac of tides, equinoctial tides; charts and their use; elementary exercises; depths, sounding lines, light-houses, beacons, semaphores, and buoys; magnets and their properties; compass, declination, and variation; logs.

3rd. *Local practical instruction:* study of the geography of the neighbouring coasts in the English Channel, for instance, of the French and English coasts visited by the coastal fishery; local fishing places, walks along the seashore; animals and plants.

4th. *Practical exercises:* manual work; the sailor's knot, demonstration and exercises, anchoring, splicing; blocks, tackle, mounting and unmounting of tackle; nets, making and mending (visits to the sail-lofts, rope walks, forges, etc.); demonstrations of running manœuvres; principles of swimming.

II. SUPERIOR COURSE.

1st. *Rudiments of navigation:* movements of the stars, the equator, parallels, meridians, position of a star; ecliptic, position of the sun with reference to the

horizon and the vertical; computation of time; charts, indicating the position within sight of land, reducing the sounding-line to zero of the chart; use of the compass, course by the compass, magnetic course, true course, course of the ship, drift; sextant, use, practical determination of the position at sea; barometers, knowledge and forecast of the weather, cyclones; international code of signals.

2nd. *Rudiments of maritime law:* legal status of mariners; naval enlistment, personnel subject to enlistment, military obligations of those who have enlisted, benefits granted to naval recruits, organization of the service; navigational and coastal fisheries police.

3rd. *Rudiments of hygiene:* hygiene for sea fishermen; first aid to the wounded and the sick; use of the principal remedies on board fishing vessels; preservative processes on board.

Navigation in Primary Schools.

The decree of September 20, 1898, was put into execution in over 400 primary schools on the coast. The rapid development of the educational courses in navigation in these schools is due in great part to the efforts of Inspector-general Coutant and to the devotion of the directors of the fishing schools at Groix, Dieppe, and Arcachon, who trained primary teachers by means of lectures and courses.

Furthermore, the Sea Fisheries Congress held at Bordeaux in 1907 requested that the method of instruction in sea fishing be reorganised on new bases from both the vocational and the theoretical points of view, and that there should be established for the benefit of the pupils fishery diplomas of several grades, which should confer advantages on them during their working career, *e.g.*, by promoting them to be sailors of the 2d. class. The study of these various questions was entrusted to a commission appointed by the Minister of Marine.

The following is an illustrative sketch of the organization and system of education of three of the French schools of fishing.

Municipal School at Sables-D'Olonne.

This school, 67 rue du Port, and la Chaume, route de l'Ermandèche, receives naval recruits from the department of La Vendée, from 12 years of age upwards.

The courses and lectures are held at two periods, one in March at Sables, and the other in November at la Chaume.

The course of instruction comprises the following subjects: dictation, composition, and marine reports; practical arithmetic and geometry; geography; English nautical terms and ordinary words; practical navigation; school of seamanship; manœuvring, and coastal navigation; fishing apparatus; repairing damages to boats and rigging; regulation of navigation and coastal fishing; life saving; hygiene and first aid to be given to wounded or sick sailors; fishing economics; edible marine species; processes for preparing and preserving

fish; economics for fishermen (insurance, provident societies, and relations between the master and crew).

Exercises and applications are carried on at sea. At the end of each period of the courses, recruits who have followed the instruction with the most profit are awarded prizes consisting of either boxes of mathematical instruments, charts, marine glasses, compass, sextant or octant, etc.

Fishing School at Groix.

The course of instruction here (Ile de Groix, Canton of Port Louis, Morbihan), comprises the following subjects: composition, practical arithmetic and geometry; use of charts and instruments, determination of the position of a ship at sea; fishing nets; regulations concerning fishing and signals; regulations concerning fires; to prevent collisions at sea; fish conservation; repairing damages; life-saving apparatus; pouring oil; head anchor; maritime hygiene; aid in case of accidents; abuse of alcohol; and swimming.

Maritime Fishing School at Dieppe.

The school of maritime fishing at rue de l'Entrepôt, Dieppe, is an annex of the school of hydrography. It was founded, as was also the latter, by the Board of Trade.

The courses comprise the following: the use of charts, and of the almanac of tides and the octant; problems of routes; life-saving apparatus; pouring of oil; rudiments of the construction of fishing boats and small boats; on the repairing of damaged rigging, masts or hull; on pilotage and landing; on fire regulations; fog signals and maritime fishery regulations; also a practical rudimentary knowledge of the action and management of those machines with which sailors must prove they are acquainted in order to be authorized to command a steamboat (decree of July 17, 1908).

Practical lessons on the making and mending of nets (trawls, seines, stake-nets, etc.); on the preparation of lines for catching whiting, cod, dogfish, etc.; on the preparation and preservation of fish; on the cooper's art; maritime hygiene; aid to be given to the sick or wounded before the arrival of the doctor, and the use of a small medicine chest.

CHAPTER LXXIII: SCHOOLS OF NAVIGATION.

There are four technical schools in Scotland where navigation is taught, viz.:—at Glasgow, Leith, Dundee and Aberdeen, all founded in 1855. Outside of the chief fishing centre of Aberdeen they train men mostly for certificated positions in the mercantile marine.

SECTION 1: NAVIGATION SCHOOL AT ABERDEEN.

This school has three distinct branches of work, viz.:—

1. Classes in navigation and seamanship for men who are preparing themselves to qualify for Board of Trade Certificates as mates, masters and extra masters.

2. Short courses in navigation for public school teachers during three weeks in the summer.

3. Extension continuation classes for 8 weeks in January, February, and March in neighboring small ports:—Peterhead, Buck Head, Lossiemouth, Findochty and Port Essay.

The work in the regular classes in navigation for candidates for Board of Trade Certificates is much the same as at Hull and Grimsby in England, except that net-making and mending are not taught.

Classes for Public School Teachers.

The classes for public school teachers were instituted in 1910. They came in response to a demand for evening Continuation Classes in navigation in fishing communities. This demand came about by a regulation in 1909 of the Board of Trade that all mates and masters on steam vessels of 50 tons or over should have certificates. (The Board of Trade at this time offered to give equivalent certificates of service to mates and masters who had served a certain number of years, but it was greatly to the credit of the men entitled to these certificates that they almost universally chose to study and take the regular examinations.) There had also been a rumor that the Scotch Board of Education intended to require a knowledge of navigation on the part of public school teachers in fishing districts.

The summer course is carried out under the authority and at the expense of the Aberdeen Training Centre of the educational district of Aberdeen (one of the five districts into which Scotland is divided for educational purposes).

The teachers who attend the summer course usually receive a grant from their respective county councils to cover transportation expenses. This grant is given after the teacher has produced evidence that he has attended the class. The course covers the time of two summers. The usual procedure is to give

the teachers navigation from the mathematical and theoretical standpoint and then to take them out on a tug for two days where they learn the different operations that usually fall to the mate and master of a steam vessel. After this the rest of the instruction deals with the applications of theory to practice. A few of the public school teachers are women who acquit themselves quite as well as the men. A number of these teachers had initiated evening Continuation School work in their respective communities after taking this course.

Classes at Auxiliary Centres.

In the evening Continuation Schools held under the direction of the Navigation School at the six neighboring ports the subjects taught were those which would qualify the students to take the examinations for mates and masters. Each student paid a fee of 10s. and the classes were self supporting.

The teachers were, with one exception, former students of the Navigation School and in actual charge of vessels. The students, with almost no exception, had had only the training given in the elementary schools. Many of them successfully passed the examinations after the winter's training. In each community the public school rooms were used for the classes for which the Navigation School paid only the extra cost of heating and lighting.

Building and Equipment.

The Navigation School is conducted in three rented rooms on the second floor in close proximity of the docks. The principal said that it was absolutely necessary to the success of a Navigation School that it be situated close to the docks to preserve the atmosphere to which the seafaring men are accustomed. The amount of money necessary for a new building (£7500) had been granted a number of years ago from the Scottish Education Board and other sources but the actual construction has been held in abeyance, awaiting the reorganization and new buildings of a new Technical College under the control of Gordon College. This new scheme is expected to come to fruition within two or three years, when the Navigation School will have adequate commodious quarters in a new building near the docks under the general management of Gordon College.

The school is well equipped with apparatus in the way of instruments and models for teaching navigation, nautical astronomy, and seamanship.

Attendance.

The school has about 200 men on its roll who are attending the classes for mates and masters. About 5 or 6 men a year prepare themselves for the examination for extra master. These are about equally divided between men following the mercantile marine and fishing. The first year the summer courses were opened, there were 41 teachers in attendance, among whom were 4 women and 3 of H. M. Inspectors of Schools. This year (1911) there are 29 teachers in this class, 2 of whom are women.

Instructing Staff.

The staff consists of the headmaster, two regular assistant instructors and a doctor, who gives part time services in holding the lectures in first aid to the Injured.

The headmaster secured his early technical training at the Leith Nautical College and was at sea for 15 years in all different capacities in fishing boats and in the mercantile marine. He has been engaged in teaching at the Navigation School in Aberdeen for 15 years and is an enthusiastic teacher and good organizer.

Cost.

The total cost of the school is about £850 a year. The main part of this expense is met by a direct grant from the Scotch Education Board.

SECTION 2: NAUTICAL COLLEGE AT LEITH.

Leith is really the harbour of Edinburgh, the two cities being only a few miles apart. Leith has a shipbuilding industry of considerable proportions and many other manufacturing establishments. The Leith Nautical College is recognized as one of the Central Institutions by the Scotch Education Board.

There are really three departments of work:—

(1) Navigation, Nautical Astronomy, etc., as preparation for candidates for Board of Trade Examinations; higher nautical education including Naval Architecture and Ship-building and Design of Marine Motors, etc.

(2) Short Summer Course in Navigation for public school teachers;

(3) Extension classes in the form of evening Continuation Schools in Navigation for fishermen in neighboring ports.

The work in Departments (2) and (3) is very similar to that already described in the account of the work of the Navigation School at Aberdeen.

Courses of Instruction.

The teaching arrangements are framed to suit the needs of the migratory seafaring community. Students can enter at any time, and can attend for long periods, or for recurring short periods, as may be convenient to them.

The program of instruction is as follows:—

(A) Preparation for the Board of Trade Examinations,
(B) Higher Nautical Education, including Naval Architecture and Marine Engineering,
(C) Elementary and Special Nautical Instruction.

(B) THE HIGHER NAUTICAL EDUCATION.

(i) The Mathematical basis of navigation and nautical astronomy.
(ii) Navigation, nautical astronomy, and spherical astronomy, in all their branches, including practical observation, calculations, and graphic methods.
(iii) Marine surveying.
(iv) Physics:—
(*a*) Oceanic metereology and instruments; bearing of meteorological elements on ocean routes and on ship manoeuvring in cyclones.
(*b*) Sound and light in their relation to the marking of sea dangers.
(*c*) Heat in its relation to fuels in ship propulsion and in relation to dangerous cargoes.
(*d*) Magnetism; general laws; terrestrial magnetism; ship's magnetism.
(*e*) Electricity; properties and effects of electric currents; measurements of electric currents; electric pressure and resistance; electric measuring instruments for ship use; generation of electricity; wiring of vessels; electric lighting and electric motors in ships; long distance signalling (ethergrams); transmission of signals through water.
(*e*1) Electricity on board ship, chiefly practical (evening course).
(*f*) Seamanship; treated as a branch of applied mechanics.
(v) Shipping and Commercial Law; the commercial duties of a ship master.
(vi) Naval Architecture and Shipbuilding; a course leading up to, and including original design (day and evening courses).
(vii) Marine Engineering; the Board of Trade Examination for Extra First Class Engineers (day course).
(vii) Marine Engineering; the original design of marine motors (evening course).
(viii) Ship surgery, medicine, and hygiene at sea, with hospital visits; one summer course (day) and two winter courses (one day and one evening).
(ix) The new courses in first aid, made compulsory by the Board of Trade, are also provided, the classes meeting three times weekly during the whole year.

(C) THE ELEMENTARY AND SPECIAL NAUTICAL INSTRUCTION.

(i) Special classes for fishermen, in fishermen's navigation, weather knowledge, knotting and splicing and rigger's work; and a short course in ship surgery and medicine.
(ii) Courses of instruction to teachers in the fishing and smaller sea ports.
(iii) A short course of popular evening lectures on nautical subjects.

(iv) A short course of elementary navigation and rope knotting and splicing for boys who will shortly go to sea. Boys who are going to sea and come to the Nautical College for a period not exceeding six months before going to sea, for this specialized instruction, find their teaching on board, by the shipmaster, easier and pleasanter.

Electricity on Board Ship.

An experimental course, including such verbal instructions as are necessary for understanding and performing the experiments, is arranged to suit engineers and others who can attend only when their vessels are in port. The instruction is therefore chiefly 'individual instruction.' Such students may join at any time, attend as they can, and complete their course in the present or succeeding sessions.

Ship Surgery, Medicine, and Hygiene.

A course of about 16 lectures and hospital visits, specially arranged for, is open to all persons connected with the sea. To suit the convenience of those in active service, seafaring students may join at any time and complete the course at any time.

A short course of public lectures is given on subjects connected with navigation, shipbuilding or marine engineering in January. These are free to all.

Fishermen's Classes.

Special classes are held at the College, or at any of the fishing ports, where arrangements are made by the Local Education Authorities. Fishermen who attend at their own option may come to the College at any time.

INSTRUCTING STAFF.

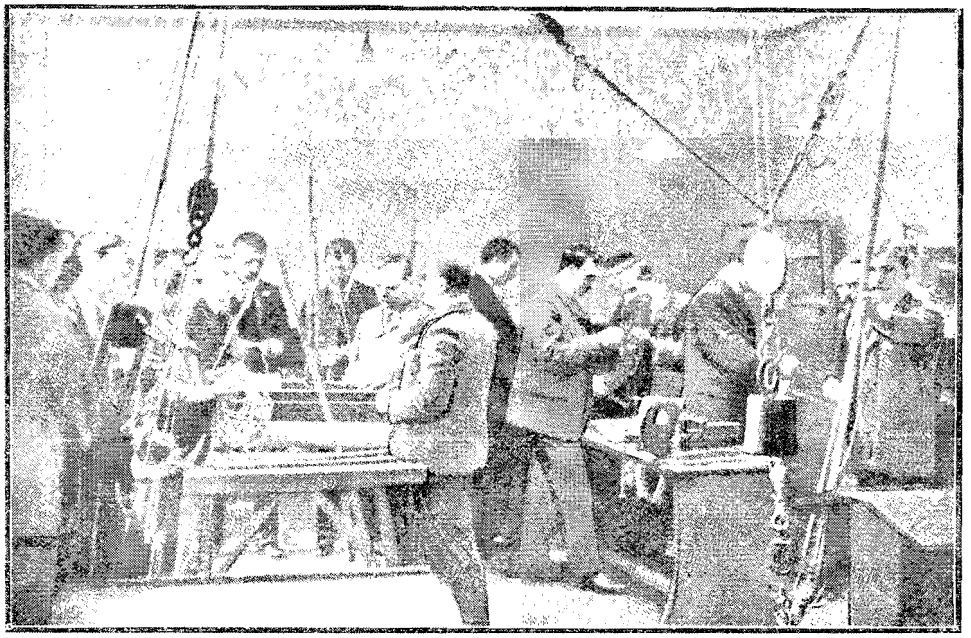
The Instructing Staff consists of nine men, four of whom give full time to the work. The departments are:

Nautical Subjects, Naval Architecture, Marine Engineering, Electricity, Ship Surgery, Medicine and Hygiene, Riggers' Work, Signalling.

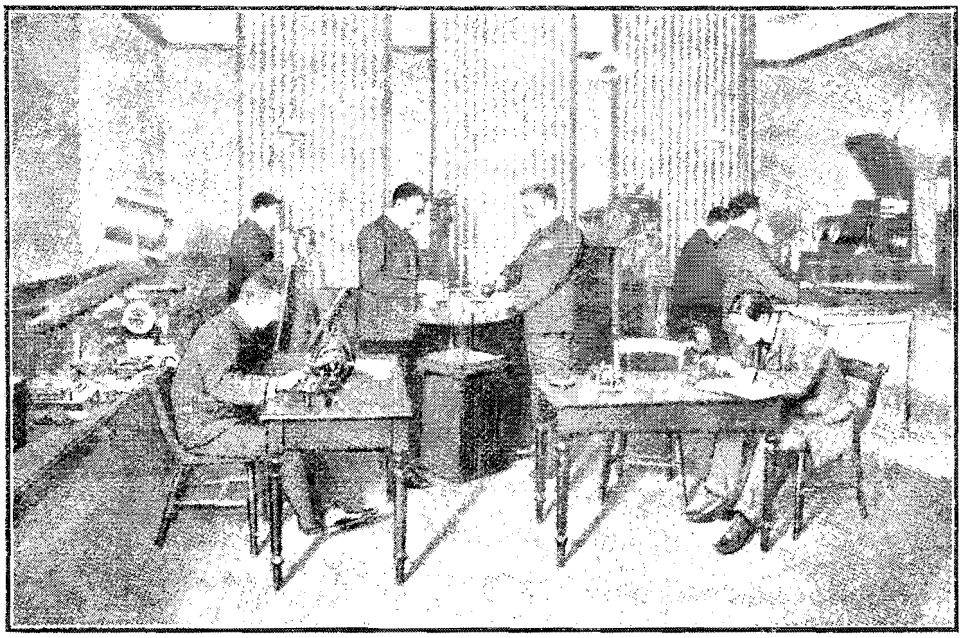
The Instructors in nautical subjects are old students of the Nautical College and have extensive practical experience also. The Instructors in Naval Architecture, Marine Engineering, and Electricity occupy responsible posit ons with leading industrial establishments or are in consulting practice

BUILDING AND EQUIPMENT.

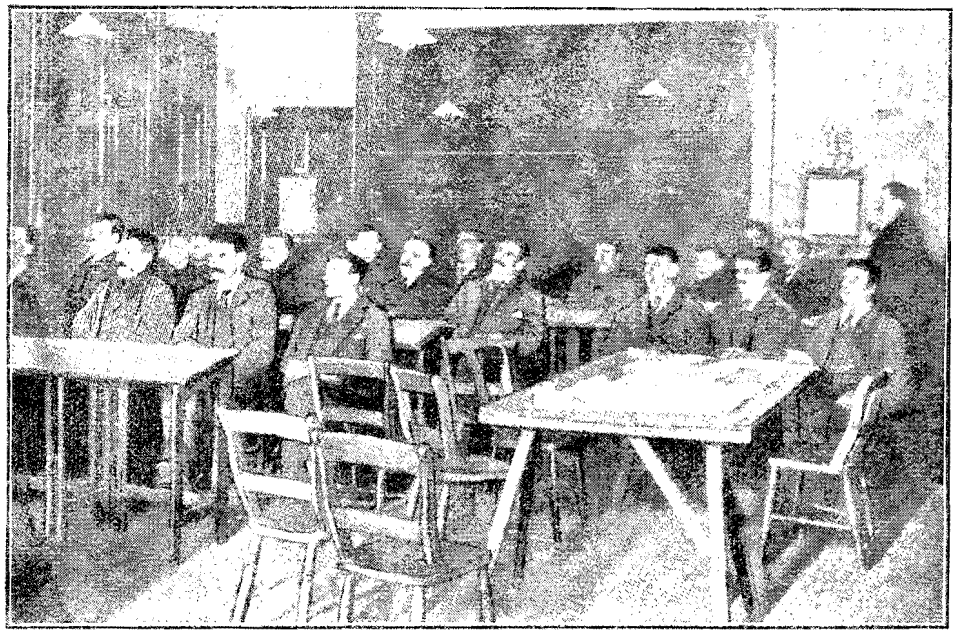
The present building occupied by the college is a very handsome stone structure, erected close to the principal docks in 1902-3. The building was



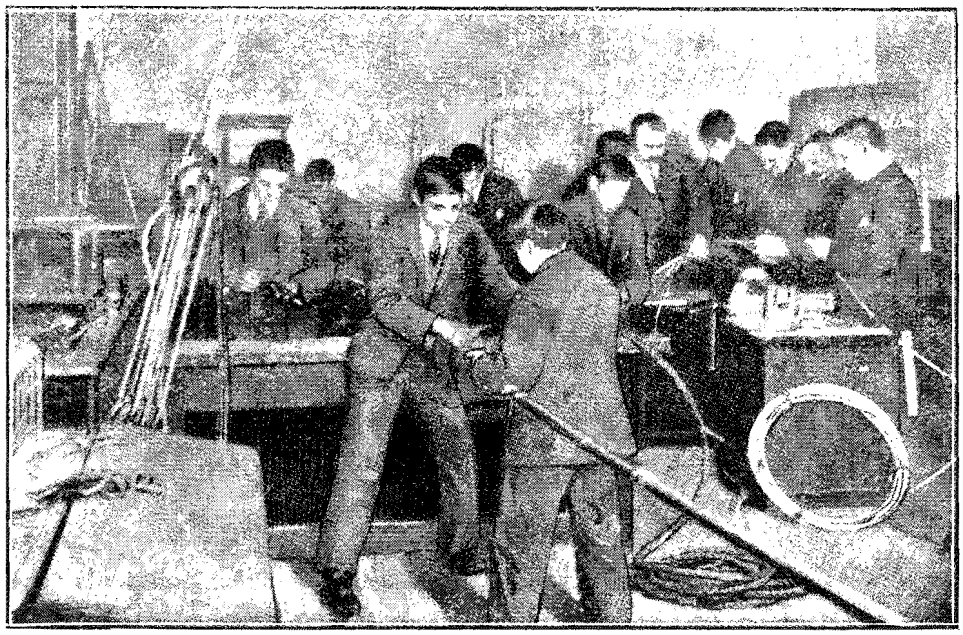
OFFICERS' CLASS: "DEMONSTRATION IN THE MECHANICS OF SEAMANSHIP."



OFFICERS' CLASS: "EXPERIMENTAL WORK IN PHYSICS LABORATORY."
LEITH NAUTICAL COLLEGE.



ADULT FISHERMEN'S CLASS: LECTURE ON "WEATHER."



FISHER BOYS' CLASS: "KNOTTING, SPLICING, AND RIGGERS' WORK."
LEITH NAUTICAL COLLEGE.

carefully planned by the present headmaster, and is admirably suited for the work. The space is already inadequate to accommodate the growing classes in Naval Architecture and the authorities are planning an extension to the building for this purpose in the near future. The present building cost £5,000.

The College has a well equipped physical laboratory, a mechanical laboratory, and excellent class rooms, well supplied with appliances for every branch of nautical education. Special care has been taken in the physical laboratory to provide for experimental work in magnetism and electricity in regard to their seafaring applications, matters which every modern shipmaster and officer should be expert in; and, in the mechanical laboratory, for the teaching of seamanship, mechanical testing, and shipbuilding.

Electric current is supplied to the laboratories from the town mains, at 230 volts, experimental cables being taken to three switch boards. Electrically-driven fans secure pure air. All the windows are in the French style, and are double, to deaden street noises. They are provided with two sets of blinds, dense black and ordinary, to secure the darkening of the rooms in daylight when necessary for electric lantern work or other purposes.

During the session 1907–8 a large addition was made to the appliances for Navigation, Marine Engineering, and Naval Architecture, etc., including a full set of Lord Kelvin's navigational instruments, a complete set of meterological instruments (including those for deep sea work), a portable transit instrument and a fine $4\frac{1}{2}''$ Wray telescope; and in 1908–9 a splendid sectional model of a ship, costing £240, and a great number of working models of marine engines, were purchased.

The total cost of the equipment was about £15,000. It seems to be very complete and carefully selected for the work.

SESSIONAL PAPER No. 191d

CHAPTER LXXIV: SCHOOLS FOR THE TANNING AND LEATHER INDUSTRIES.

One of the interesting and important departments of industrial and commercial life of Canada is the leather trade and its allied industries of harness making, boot and shoe manufacturing, upholstering, glove making, etc. A brief outline of some institutions which provide technical and practical training for boys intending to enter this field of industry should prove instructive.

The institutions visited by the Commission which provide special training for the leather trade were:—

(*a*) The Tanning School at Freiberg, Germany;
(*b*) The Pratt Institute, at Brooklyn, N.Y.;
(*c*) The Leather Sellers' Technical College, at London;
(*d*) Leeds University;
(*e*) The School of Tanning, at Lyons, France.

The School at Freiberg, the Pratt Institute and the Leather Sellers' College provide technical training with some scientific instruction of Secondary School grade to qualify for positions as foremen and managers. The University Course at Leeds is intended for the advanced scientific and technical training of specialists and experts.

A: THE TANNING SCHOOL AT FREIBERG.

The institution consists of three separate Departments devoted respectively to technical education, practical training and research work. In the first, boys or young men who have served their apprenticeship and are desirous of qualifying themselves to become foremen and superintendents can take a one year course of specialized study in the commercial and chemical aspects of their work. In the second they can supplement this learning by training in practical tanning.

In connection with the school there is a small leather works employing seven men. At the works leather is manufactured and the school authorities sell the finished product on the open market.

The small tannery is run on a strictly business basis, turning out about $12,000 worth of saleable product per annum. Being managed by a practical man previously in charge of a large tannery, it affords ample opportunity for the gaining by the students of practical experience under ordinary working conditions.

In the third Department there is an experimental research laboratory, where experiments are made for the Association of Tanners into all matters affecting their trade, and by means of which the students are kept in close touch with all new developments and problems under investigation.

All three Departments are supported entirely by the Association of Tanners, who consider it to be in their own interests to have such an institution in operation. The advantage of the School Tannery being run as a commercial business, and having its own staff of seven workmen apart from the school proper, is that it is thereby made almost self-supporting and that the students have an opportunity to do the kind and amount of manual labor necessary for them to learn properly the effect of the various processes.

The majority of the pupils are sons of former students now engaged in the tanning industry.

B : THE PRATT INSTITUTE.

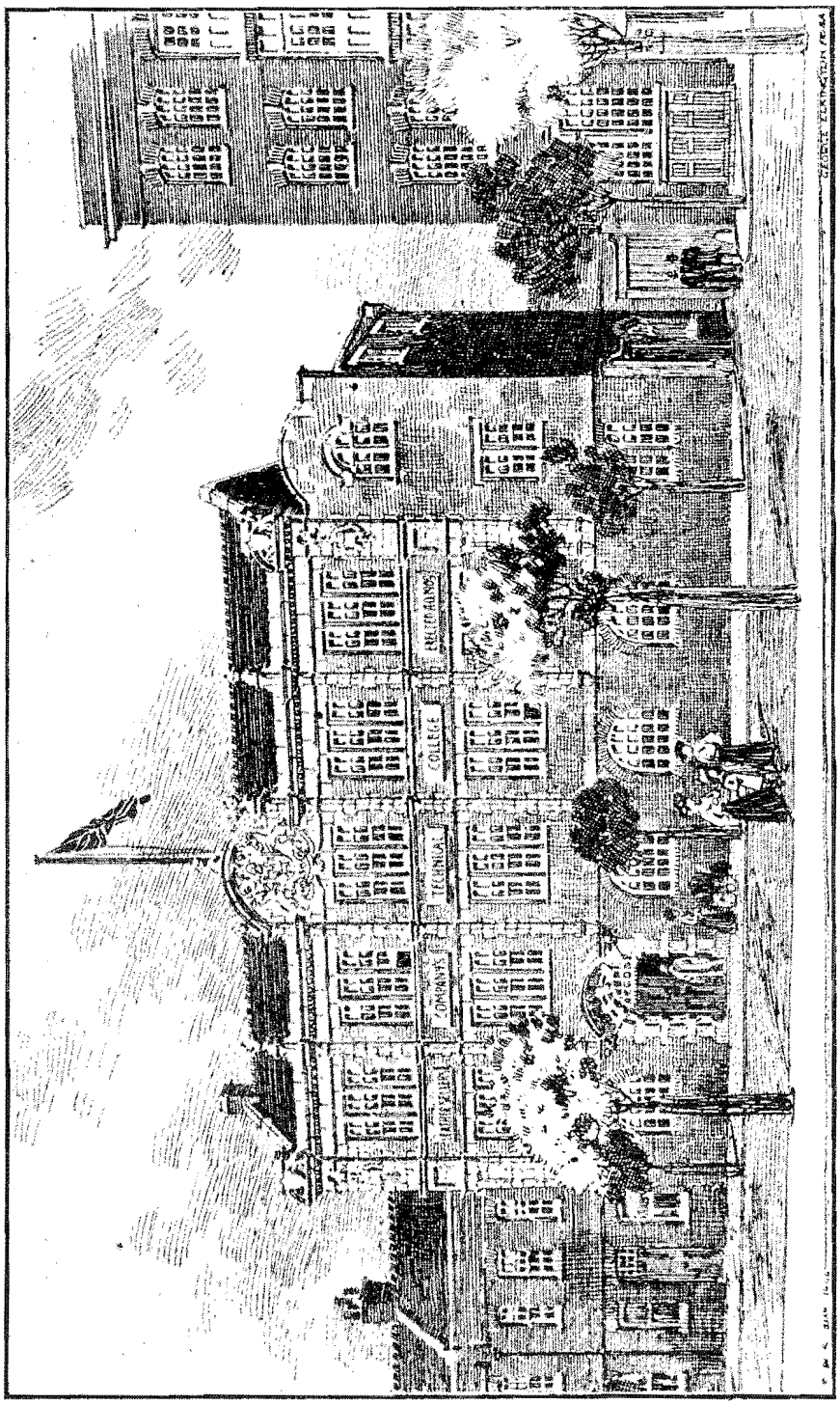
At the Pratt Institute the work in this Department is divided into two sections: a one year Day Trade Course, and a one year Industrial Course. The latter is available only to those who have graduated from a four year Chemistry Course in a College or Technical High School, or have had already an extensive training in general chemistry.

The Day Trade Course is intended to give practical working tanners a course of training in the art of tanning and finishing different kinds of leather, and to enable them to acquire a broader knowledge of the principles involved than they could hope to attain under the ordinary conditions of commercial manufacture. They are thus fitted for positions of greater responsibility and remuneration. Students in this class become familiar with every detail of the tanning and dressing of leather by actual work in the Institute's Tannery. This tannery is equipped with modern machines for leather production on a scale sufficiently large to render processes and results reliable.

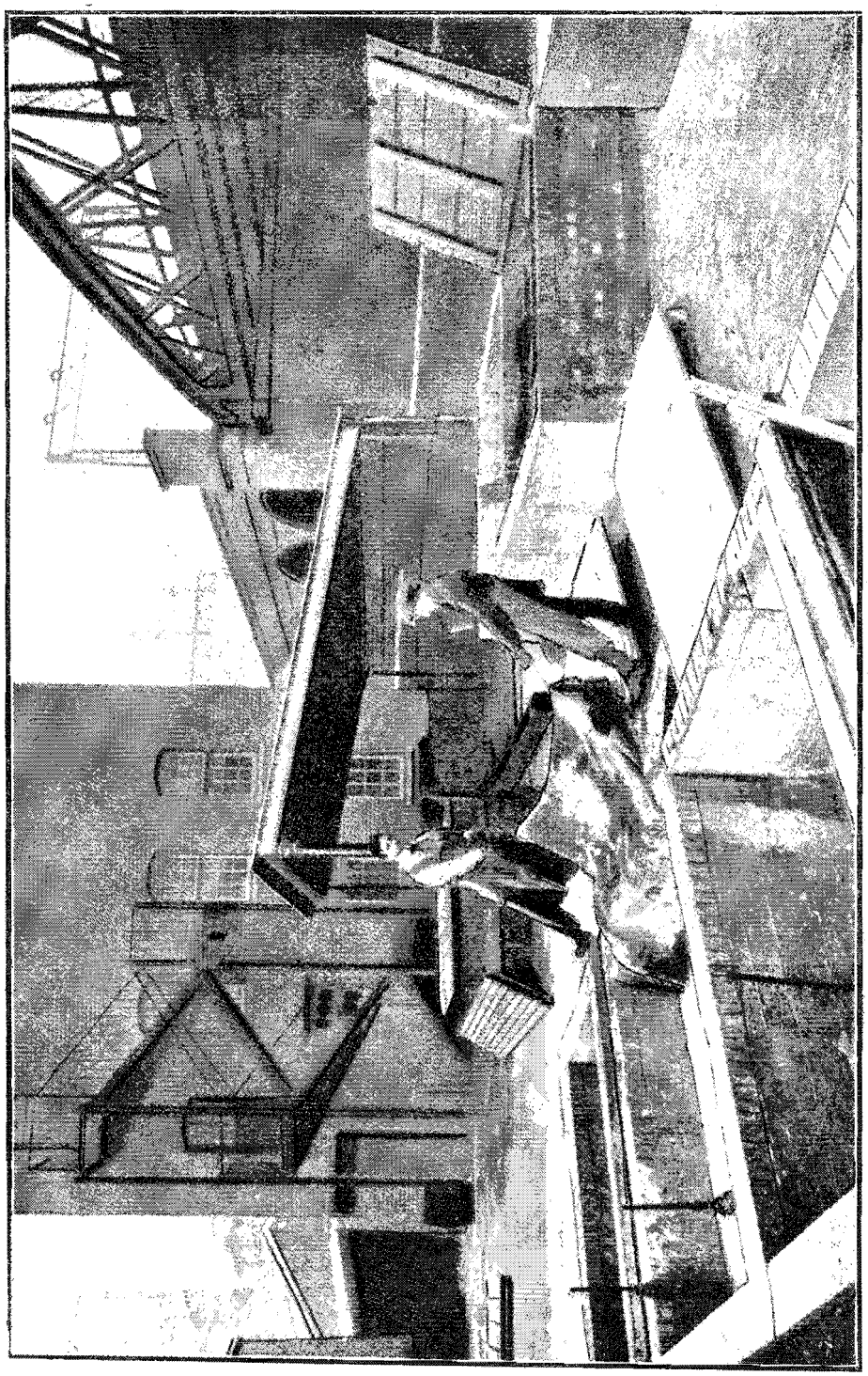
For the Industrial Course completely appointed laboratories provide for instruction in general chemistry as well as in the analytical and technical chemistry applicable to the tanning and manufacture of leather. The Course includes the testing of dyes, the manufacture of extracts, etc.

C : THE LEATHERSELLERS' TECHNICAL COLLEGE.

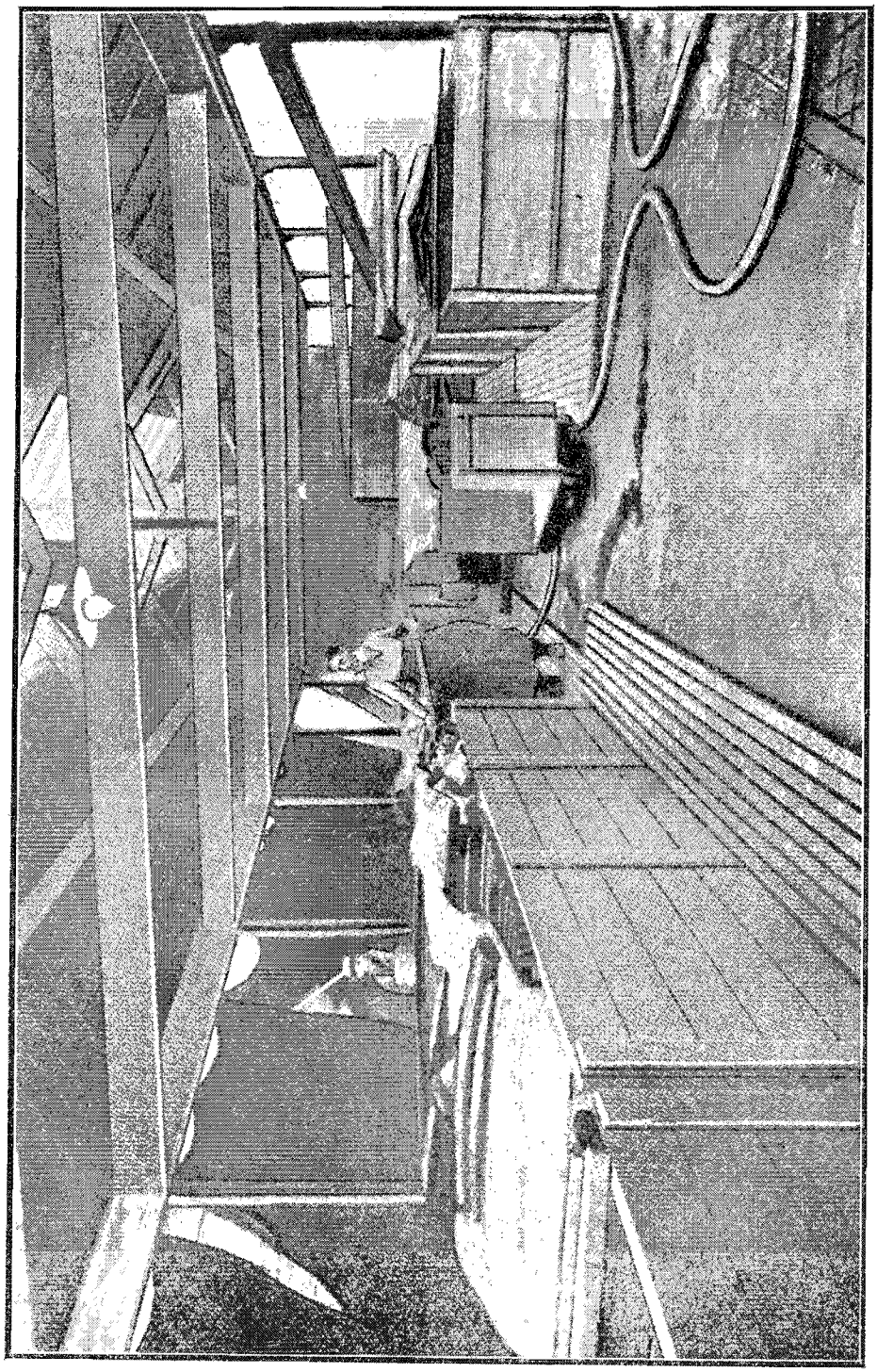
The Leathersellers' Company's Technical College, at London, has an up-to-date leather factory, equipped with modern machinery. It possesses also an adequate chemical laboratory for research work, a museum containing numerous exhibits showing in a very graphic manner the results of various mistakes in tanning and the effects of injuries to the skin of the animals. This institution was built and equipped by the Leathersellers' Company at a cost of about $100,000. Apart from a small annual grant from the London County Council towards the Evening Classes it is maintained by the Company.

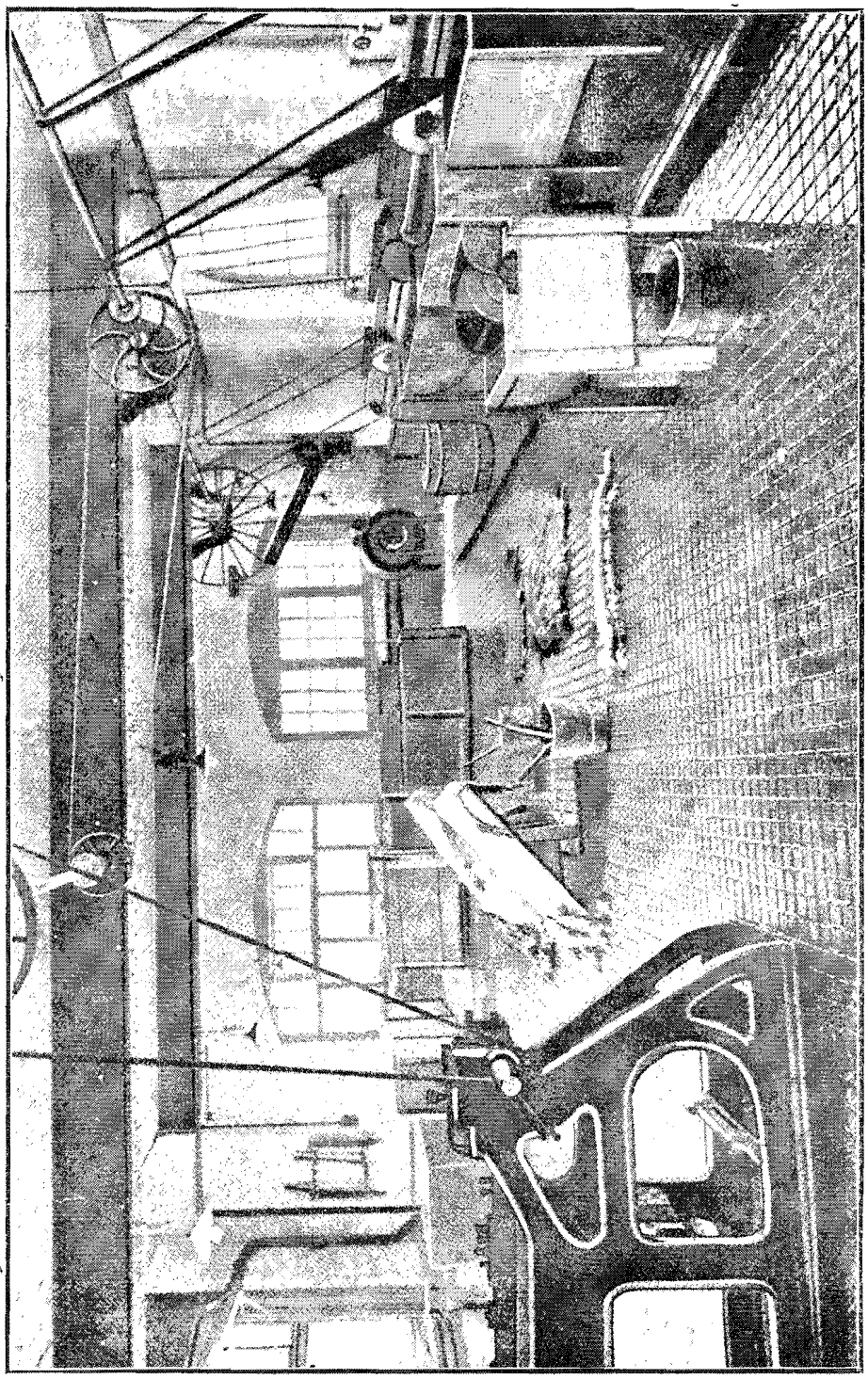


THE LEATHERSELLERS' COMPANY'S TECHNICAL COLLEGE.

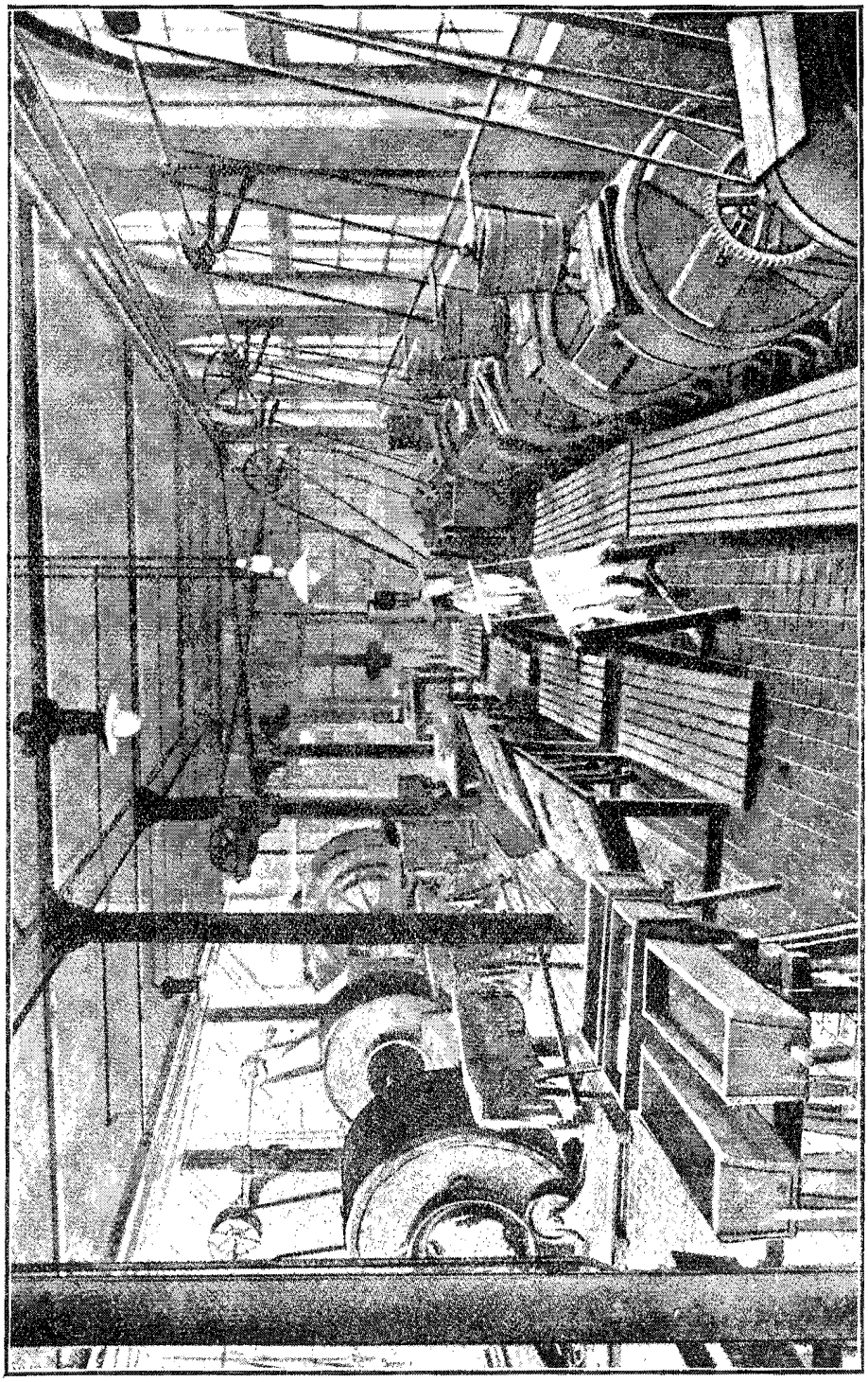


LIME YARD: LEATHERSELLERS' COMPANY'S TECHNICAL COLLEGE, LONDON.

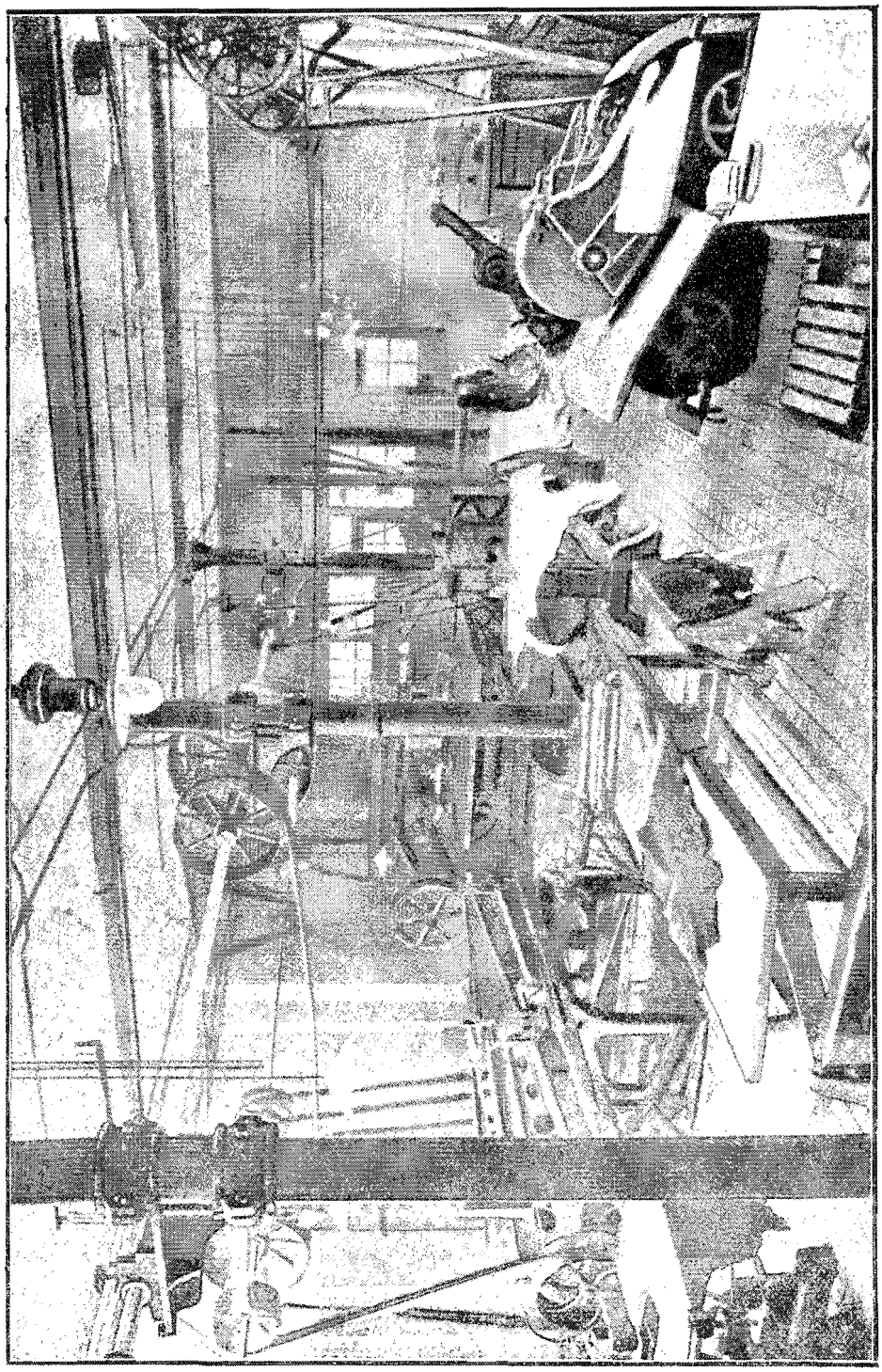




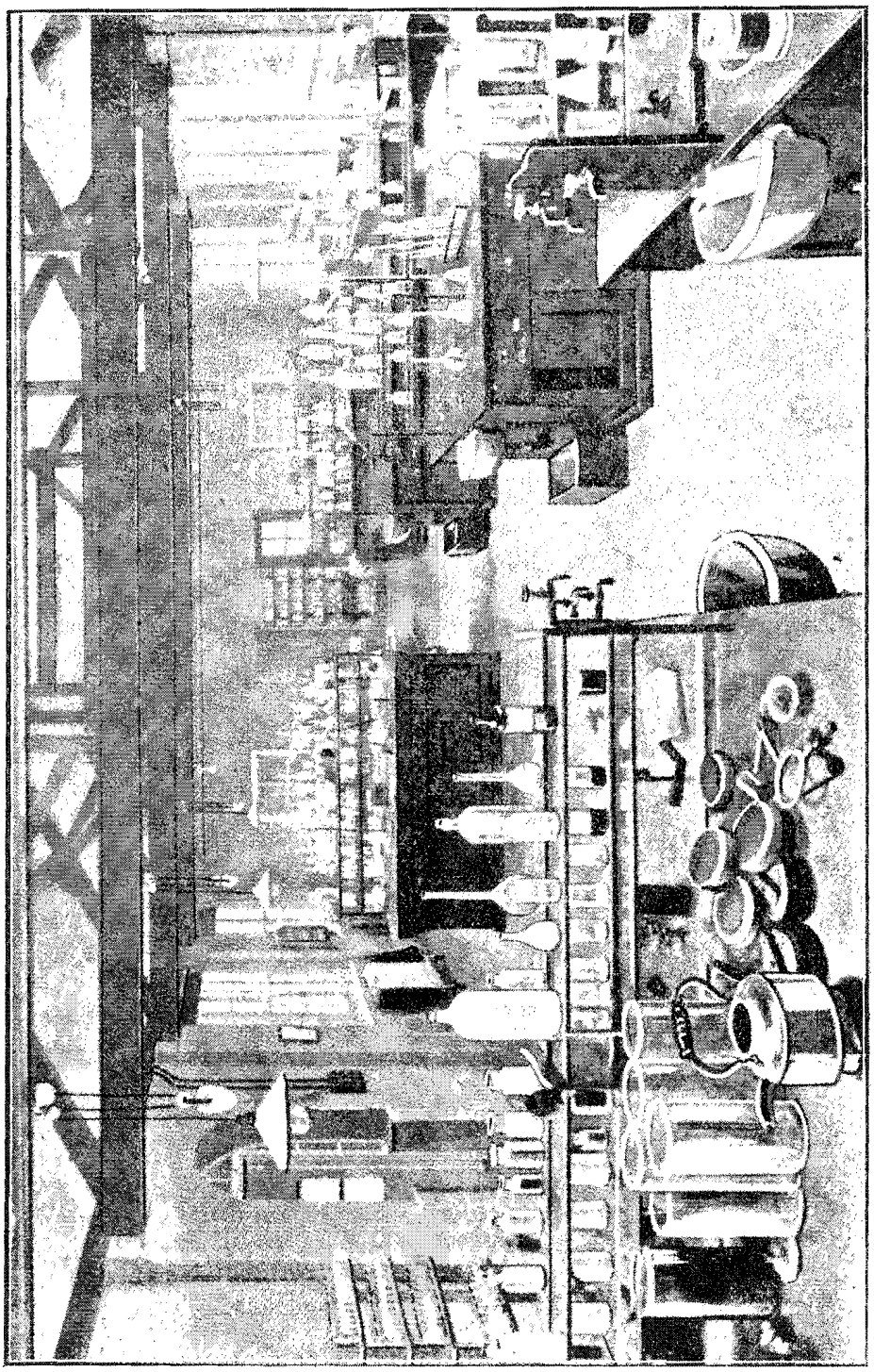
LIGHT LEATHER TAN HOUSE: LEATHERSELLERS' COMPANY'S TECHNICAL COLLEGE, LONDON.



DRY HOUSE: LEATHERSELLERS' COMPANY'S TECHNICAL COLLEGE, LONDON.



FINISHING SHOP: LEATHERSELLERS' COMPANY'S TECHNICAL COLLEGE, LONDON.



GENERAL VIEW OF SHOP

Young men of adequate educational qualification (Junior Matric.) can take a Course which will fit them to become superintendents and managers of tanneries or similar works. The full Course occupies two or three years according to the qualification of the student on entering. Graduates of the School have taken responsible positions in leather manufacturing establishments in China, India, Canada and the United States.

Men from all trades directly connected with leather, even to the mere selling of boots and shoes, may get a thoroughly practical training in their work at the Evening Classes. The Evening Classes have as their chief aim the making of better and more competent workmen, and it is to this department of the work of the school that the grant of $2,500 from the L. C. C. is devoted, in order to give working men with limited incomes an opportunity of training themselves for higher positions.

The College fits in with the more advanced scientific work at Leeds University and some of its students go there for that.

D : LEEDS UNIVERSITY.

At Leeds University the highest Technical Education in regard to the leather industries is obtainable. There is no practical manufacturing work. Instruction and training are provided leading to an understanding of the principles and methods of leather tanning, analytical chemistry and laboratory work generally in connection with the problems confronting the modern manufacturer. Students must have taken a previous four year course in chemistry or its equivalent in order to secure admission.

The Course is devoted chiefly to Analytical Chemistry, Bacteriology, and Microscopy in relation to the leather industry.

Classes are held in,—

Principles of Leather Manufacture, Physics and Chemistry of Leather Manufacture, Methods of Leather Manufacture, Analytical Chemistry of Leather Manufacture, Technical Bacteriology, Technical Microscopy with Laboratory.

In Evening Courses lectures are given on,—

The tanning and currying of light and fancy leathers; mineral tannage; glove kid, calf kid; formaldehyde tannage; and dyeing of different kinds of leather.

E : THE SCHOOL OF TANNING AT LYONS.

(Chemical Institute of the University).

This School was established in 1899, under the patronage of the general French Syndicate of Leathers and Skins. Its object is to train young persons for business in leather and skin manufacturing and for the allied industries that use these products, as heads of firms, as superintendents of workshops and professional chemists.

The Course occupies two years and is excluisvely for day scholars, who must attend the school on all days except holidays, from 8 to 11.30 a.m., and from 1.30 to 6 p.m.

Candidates must be of the full age of 16 years before July 1st of the year in which they present themselves. They are admitted by competition, comprising written and oral examinations bearing on the same subjects and the same program as for the Chemical School competition. Besides the obligatory examination candidates may undergo optional examinations in sciences or modern languages. Those who possess qualifications or diplomas are entitled to benefits in marks.

Those who desire to take only the special Courses of the school without laboratory work, may be admitted as outside students without examination, by authority of the general syndicate and the Director of the School of Industrial Chemistry.

Instruction is given at the faculty of sciences of the University, where pupils are registered and take Courses in Physics and Chemistry, open to all the students; also four Courses having reference to the leather industry, which were established for them by the syndicate.

Courses and Laboratory Work.

The following is a list of the Courses attended by the pupils each week:—

1st year: 2 Courses in general mineralogical chemistry, 2 in chemical technology, 4 in industrial chemistry, 3 in industrial physics, 1 in chemistry applied to tanning and 1 Course in micrography and natural history applied to the leather and hide industries.

2nd year: 2 Courses in organic chemistry, 4 in industrial chemistry, 1 in tanning and leather manufacture and 1 in analysis and testing of raw materials and manufactured products with relation to the leather and hide industry.

Outside of class hours the pupils work in the laboratory where their studies are as follows:—

1st year: Mineralogical analysis and its application to the study of the mineral raw materials used in the leather and hide industry; the preparation of the mineral raw materials used in the same industry; and the experimental portion of the Course in chemistry applied to tanning.

2nd year: The experimental portion of the Course in tanning and leather manufacture, and the experimental portion of the Course in analysis and testing of raw materials and manufactured products.

At the conclusion of their studies the pupils undergo a final examination which, being successfully passed, entitles them to the diploma of Engineering Tanning Chemist.

The annual fee is 950 francs. Available places may be assigned to foreign students for 1,100 francs a year. Fee for security against laboratory loss or breakages, 100 francs. The Departments of the Seine and the Rhone, the cities of Paris and Lyons, and the Boards of Trade of those two cities grant a certain number of scholarships to necessitous students.

INDEX TO VOLUME II OF PART III.

GERMANY.

A

B

C

D

E

M

N

O

P

R

S

T

U

V

W

SWITZERLAND.

A

B

C

D

E

F

G

H

I

L

M

N

O

P

R

S

T

U

V

W

Z

UNITED STATES.

A

B

C

D

E

F

G

H

I

T

U

V

W

GROUPS OF SCHOOLS OF FOUR KINDS.

A

C

D

E

F

G

H

L

M