

# COTTON MANUFACTURE

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How We Train People for First-  
Class Positions in Cotton Manu-  
facture and Fabric Designing



INTERNATIONAL CORRESPOND-  
ENCE SCHOOLS, SCRANTON, PA.

# THE FIRST SCHOOLS

## *of Correspondence Instruction in the Trades & the Engineering Professions*

THOMAS J. FOSTER, President of the International Textbook Company, invented and established the International Correspondence Schools system of teaching the theory of the trades and the engineering professions in 1891.

The system has been successful for more than ten years.

### **DISTINCTIVE FEATURES OF THE INTERNATIONAL SYSTEM**

1. Courses of Instruction for particular occupations, in which only such Facts, Processes, and Principles are taught as are necessary to qualify the student therein.
2. Textbooks, Question Papers, and Drawing Plates, Prepared for each Course; Principles applied in examples of practical value to the student; Frequent Revisions to keep pace with the latest methods in trades and manufactures;
3. Thorough Examination and Correction of the written work of the student, and full, clear, and exact Written Explanations of all difficulties met with in studying.

### **INVESTIGATE IMITATORS**

In order that they may not mislead you. Their Courses are invariably not prepared to meet the requirements peculiar to correspondence instruction.

There are 358 Engineering Experts, Instructors, and Assistants in the International Correspondence Schools to compose and revise the Papers used in teaching, and to review and correct the work of students.

### **THE RESPONSIBILITY**

Of the International Correspondence Schools will bear thorough investigation. The International Textbook Company, Proprietor, is incorporated under the laws of Pennsylvania. The Company has a paid capital of Two and a Quarter Million Dollars.

Two of the International Correspondence Schools buildings were erected expressly for the purpose of correspondence instruction. These alone cost a Quarter of a Million Dollars. Seventeen other buildings are occupied by the International Correspondence Schools.

### **FOR REFERENCE**

Are given the I. C. S. students in all parts of the world; the commercial agencies, and all bank officials, clergymen, teachers, and municipal officers in Scranton. Any inquiring person is enabled to communicate with I. C. S. students in his locality. All persons and committees of inquiry are invited to investigate the System, the Courses, and the Financial Standing of the International Correspondence Schools.

### **REMITTANCES**

Should be made by Bank Draft, Express Money Order, P. O. Money Order, or Registered Letter. All Drafts and Orders should be payable to the order of the INTERNATIONAL TEXTBOOK COMPANY, SCRANTON, PA.

# Announcement



THE AMERICAN Correspondence School of Textiles, of New Bedford, Massachusetts, has been bought by the INTERNATIONAL CORRESPONDENCE SCHOOLS, of Scranton, Pa.

The Courses of Study will hereafter be known as the I. C. S. Textile Courses.

CHRISTOPHER PARKINSON BROOKS, founder and Director of the School of Textiles, will continue in charge of the instruction, which will still be issued from New Bedford.

Enrollments and all communications that relate to the School of Textiles will be addressed to the International Correspondence Schools, Scranton, Pa.

Students' work will be addressed to the International Correspondence Schools, New Bedford, Mass.

The change means, in brief, that one more School—a School of Textiles—has been added to the International Correspondence Schools, which will now be able to train a still greater number of people for better positions.



# INTERNATIONAL CORRESPONDENCE SCHOOLS

SCRANTON, PA., U. S. A.

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## INTERNATIONAL TEXTBOOK COMPANY

(Formerly The Colliery Engineer Company)

PROPRIETOR

T. J. FOSTER, PRESIDENT



HOME OFFICE AND SCHOOL BUILDINGS

WYOMING AVENUE, SCRANTON, PA.

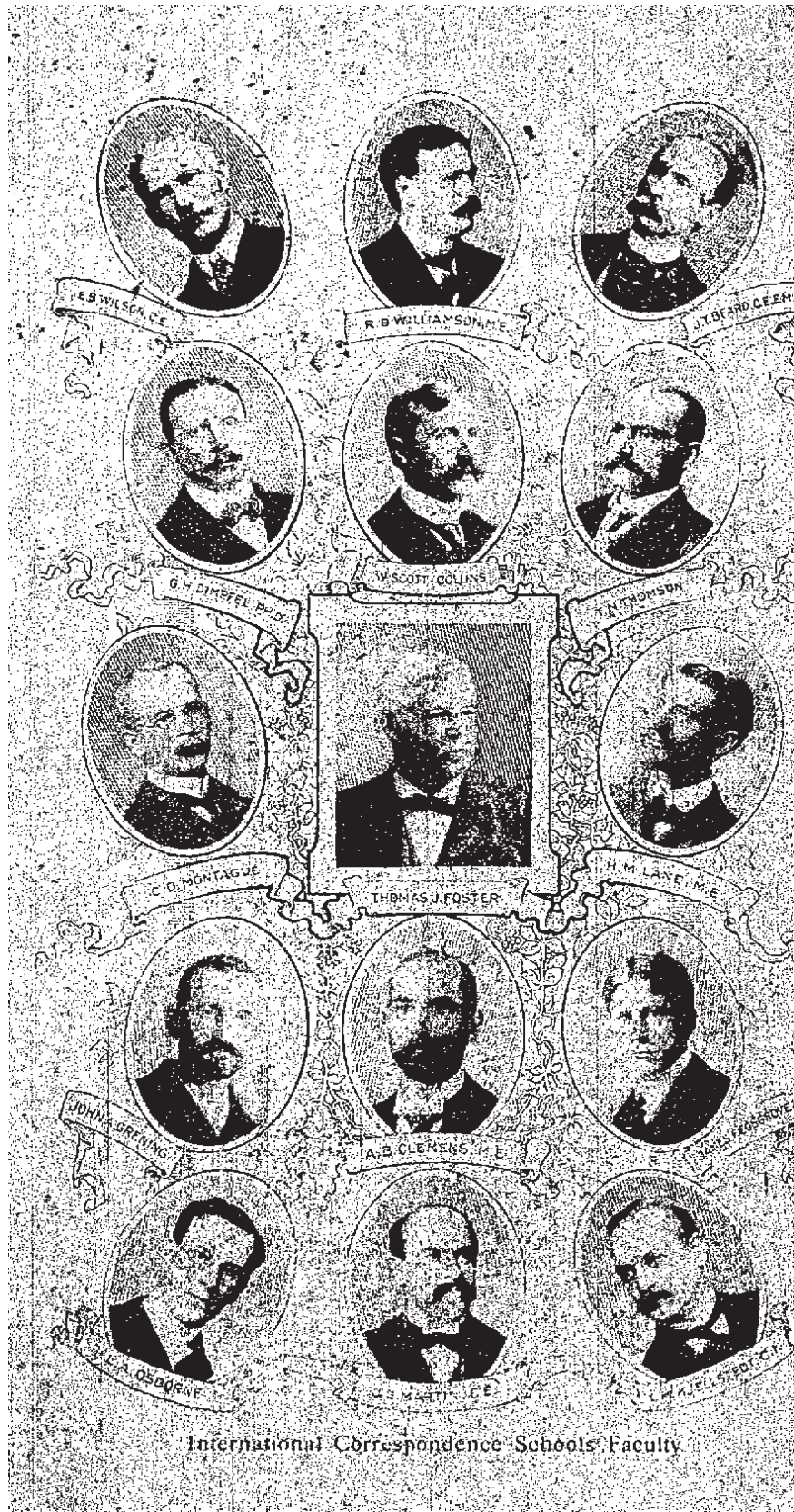
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### DISTRICT ENROLLMENT OFFICES

BOSTON, MASS., 701-707 Colonial Building,  
100 Boylston Street  
BUFFALO, N. Y., 206 and 211 Ellicott Square  
CHICAGO, ILL., 10th Floor, Manhattan Bldg.  
CINCINNATI, OHIO, 16 East 4th Street  
CLEVELAND, OHIO, 636 Rose Building  
HARTFORD, CONN., 42-44 Catlin Building,  
cor. Main and Asylum Streets  
JERSEY CITY, N. J., Com. Trust Co. Building,  
Exchange Place and York Street  
MONTREAL, QUE., 61, Mercalle Street  
NEWARK, N. J., 791 Broad Street  
NEW YORK CITY (Borough of Brooklyn),  
915 Temple Bar Building, 40 Court Street  
NEW YORK CITY (Downtown), 7 W. 22d St.  
NEW YORK CITY (Uptown), 217 W. 125th St.  
PHILADELPHIA, PA., 112 N. Broad Street  
PITTSBURG, PA., Room B, Park Building  
PORTLAND, ME., 1 Boyd Building  
SAN FRANCISCO, CAL., Examiner Building,  
11 Third Street  
SCRANTON, PA. (Central Pa.), Guernsey  
Building  
SEATTLE, WASH., 240 New York Block  
ST. JOHN, N. B., 201 Union Street  
ST. LOUIS, MO., 827 Pine Street  
SYRACUSE, N. Y., 400 University Building  
TORONTO, ONT., 413 Temple Building  
WASHINGTON, D. C., 619 Pennsylvania Ave-  
nue, N. W.



International Correspondence Schools Faculty



International Correspondence Schools Faculty

# I. C. S. Faculty

THOMAS J. FOSTER, *President*

JOHN JESSE CLARK, M. E., *Dean*

*University of Michigan*

JOHN LOWREY MARTIN, C. E., *Director of Instruction*

*University of Pennsylvania*

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## Principals

## Schools

MARSHALL KONIGSTEDT, C. E.

*University of Michigan, School of Mines, Ann Arbor*

DRAWING

JOHN ALFRED GREENING

*University of Michigan, Ann Arbor*

STEAM AND MARINE ENGINEERING

BENJAMIN FRANKLIN LA RIVE, ING. ERWEN

CIVIL ENGINEERING

MARIE W. FAUST, M. S. E.

*University of Michigan, Ann Arbor*

ENGLISH BRANCHES

THOMAS N. THOMPSON, Sanitary Engineer

*University of Michigan, Ann Arbor*

PLUMBING, HEATING, AND VENTILATION

WILLIAM SCOTT COLLINS, Architect

ARCHITECTURE

LOUIS ALLEN OSBORNE

*University of Michigan, Ann Arbor*

DESIGN

JAMES THOM BEARD, C. E., E. M.

*Columbia University*

(Coal Mining Division) MINES

NELSON HINDLEY PROUTY

BOOKKEEPING AND STENOGRAPHY

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*Massachusetts Institute of Technology*

SPANISH

GEORGE HERMANN DIAPPEL, Ph. D.

*University of Leipzig*

CHEMISTRY

WILLIAM B. RIDENOUR, M. A.

*Yale University*

PEDAGOGY

## Principals

## Schools

MAURICE DE GAYSKY SLOAN, <i>Polytechnic Institute of Brooklyn School</i>	STRUCTURAL ENGINEERING
SAABO DE PASPALMEDO, <i>Esc. Technica, Universidade, Brazil</i>	GERMAN
LIEUT. ERNEST KONRAD RUDEN, Naval Expert, <i>Government College for Naval Science, Naurun</i>	NAVIGATION
CHARLES JAMES ALLEN	LETTERING AND SHIP PAINTING
JAMES FRANCIS COSGROVE, <i>University of Wisconsin</i>	LOCOMOTIVE RUNNING
CHARLES DWIGHT MONTAGUE	SMELT-METAL WORK
HENRY MARQUETTE LANE, M. E.	MECHANICAL ENGINEERING
HENRY STORRS WEBB, M. S., <i>Massachusetts Institute of Technology</i>	TELEPHONE AND TELEGRAPH ENGINEERING
MOUNT DEBOW GRAVETT, B. SC., <i>Rutgers College</i>	MATHEMATICS AND MECHANICS
ROBERT BAIRD WILLIAMSON, M. E., <i>Cornell University</i>	ELECTRICAL ENGINEERING
A. BOWMAN CLEMENS, M. E., Associate Principal, <i>Cornell University</i>	MECHANICAL ENGINEERING
EUGENE BENJAMIN WILSON, C. E., <i>Yale University</i>	(Metal Mining Division) MINES
EDOUARD LAMAZE, B. S. and C. A. P., <i>University of France</i>	FRENCH
CHRISTOPHER PARKINSON BROOKS, <i>Member of Society of Arts, London, England</i>	TEXTILES

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## School of Electrotherapeutics

WILLIAM F. BRADY, M. D., <i>Jefferson Medical College</i>	DEAN
JOHN C. PRICE, M. D., <i>University of Pennsylvania</i>	PROFESSOR OF ROENTGEN RAYS



## Assistant Principals

WILLIAM WOOD

WYNNE ELLA BREEK

HARRY W. FLYNN

CHARLES MUSNILLI

WALLACE CHAYENAS

FRANCIS H. DIXON, A. B. B.

FRANK M. S. HALPERN, S. B.

DR. EUGENE W. WAZIE, B. S.

RUFUS TRACY STROHM, B. S.

WALTER WALLACE EDWARDS, M. E.

WARREN P. SMILEY, B. S., A. M.

## Schools

DRAWING

MATHEMATICS AND MECHANICS

LOCOMOTIVE RUNNING

ENGLISH BRANCHES

CHEMISTRY

ELECTRICAL ENGINEERING

MATHEMATICS AND MECHANICS

CHEMISTRY

MECHANICAL ENGINEERING

STEAM AND MARINE ENGINEERING

CHEMISTRY

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## Illustrating Department

CHARLES JACOB HAYES

CHIEF ILLUSTRATOR

*Academy of Design (Casper) New York*

*These officers devote their entire time to the International Correspondence Schools*

## Our Wonderful Growth

It is a unique history—the history of the International Correspondence Schools: it tells how a training-by-mail school, founded about ten years ago, has become a great educational institution.

THOMAS J. FOSTER issued the first I. C. S. Courses in 1891.

These Courses were devoted to coal mining, and there was a great call for them. Their broad scope, consciousness, and clearness made them of immediate worth to all persons interested in the subject.

Here was indeed a novel situation: thousands of men whose circumstances had made their better technical training seem impossible, were enjoying all of the advantages of a first-class mining school while at home in the evening.

It at once became apparent that the International Correspondence Schools method was the solution of a great problem—the problem of training people in the theory of what they had to practice every day, without interfering with their working hours.

Naturally, the next step was to prepare Courses in the theory of mechanics, electricity, and civil engineering. And as I. C. S. students began to thrive in all communities, the demand became urgent for instruction in other trades and professions. The result is that nearly a hundred I. C. S. Courses are being studied at the present time, and new Courses are in preparation. Each Course is in charge of specialists that are expert in practical work, and they make every possible effort to teach each student just the things that will increase his earning power.

The utility of the I. C. S. Courses is proved by the history of the students. We have grateful letters from thousands of people that have climbed the International Correspondence Schools ladder to prosperity. On many occasions employers have written expressions of gratification over what the I. C. S. instruction has done for their employes. These letters show that the International Correspondence Schools training enables people to do superior work; to be worth more to their employers and the world; and consequently to earn higher salaries.

## Why We Are Growing

Our superior textbooks and our thorough instruction are the factors that make the International Correspondence Schools grow.

In preparing the I. C. S. Textbooks, we have taken great care to make each Course a *special* Course.

Throughout our system each Course relates to some particular occupation, and is devoted exclusively to that occupation—giving no more nor less than is required. We therefore have no difficulty in furnishing the student just the Course he needs. We do not compel the student to use valuable time in mastering subjects that have no important bearing on the particular work that he is preparing for. No other school in existence specializes to such a degree.

The ordinary textbook is usually prepared by one author, who takes it for granted that his readers have a certain degree of knowledge of his subject. He writes his book accordingly, and until his readers gain from some other source the knowledge that they are supposed to have, it is impossible for them to understand the book.

In preparing the I. C. S. Textbooks, our authors assume that our students know nothing but how to read and write. Every Course begins with numeration in arithmetic, which is the most elementary subject.

Besides our regular staff of expert authors, we frequently engage outside specialists to write. These writers, like our permanent force, are always people that are skilled in the latest scientific applications. The I. C. S. Textbooks thus give the best information that can be obtained on any of their subjects. In preparing the instruction relating to shop practice, for example, we secured the services of more than a dozen outside specialists. We are thus enabled to offer the work of many experts in this one set of volumes.

The I. C. S. Textbooks do not teach how to derive formulas. Our students have no time to give to the study of subjects and processes that are valuable in mind training only. We give rules and teach how to apply them. Our examples in arithmetic, mensuration, mechanics, and the like, are so composed that the student is continually practicing with the subjects that he has to deal with in his regular work. Thus the student is never side-tracked; every problem solved is a step forward.

The I. C. S. Textbooks are the best textbooks with which to study without the presence of a personal teacher. It is obvious that books that are the most serviceable for self-instruction are also the most useful as references. The I. C. S. Textbooks are therefore recognized as the standard reference books—unequaled in conciseness, thoroughness, and accuracy. No other books are so completely indexed.

In our Instruction Department we have experts in cotton manufacture, woolen manufacture, fabric designing, as in all the other subjects that we teach. It is the duty of these instructors to answer the questions of our students relating to their studies. No communication is too trivial to receive prompt attention. The instructors write special letters to the student, carefully explaining the details of whatever subject he inquires about. We have always given each of our students every attention that he has required to finish his Course thoroughly and rapidly. If necessary we would give every student a special instructor.

Whenever the student's work shows that he needs suggestion in regard to any detail of his studies, his instructor promptly writes to him without waiting for an inquiry. The student thus gets guidance that enables him to correct his faulty methods before they become habitual.

One of the excellent features of our system is the promptness with which the inquiries of our students are answered. As soon as it is received, every letter is given attention and the answer is sent to the student within a few hours. Of course there is now and then a letter that requires so much work that we cannot mail the answer the same day that the Instruction Department receives the inquiry.

If the student continues to meet with difficulty in the study of any subject, he may ask for a special instructor, who will be assigned to him without extra charge.

The student will have the attention of his special instructor until the difficulty is overcome.

Engraved Certificates of Progress are granted on the completion of each subject of a Course, and a Certificate of Proficiency or a Diploma is awarded when the student attains 90 per cent. on his final examination.

Our interest in our students does not cease when we receive their enrollment fees. We want our students to learn, and rise to better positions, for upon their success hangs our success.

## Advantages of the I. C. S. Instruction

During all of the years up to 1891, a student had the choice of two methods when he wanted to qualify himself for earning a livelihood: he could go to work in some mill and learn a trade as it was practiced in that particular mill, or he could enter some educational institution and learn a theory as it was taught in that particular institution. In the mill, the student got a rule-of-thumb knowledge of the trade—an excellent thing as far as it went—but he got little comprehension of its real principles. In the educational institution, he got an extensive theoretical knowledge—of great value when supplemented with practice—but he got little comprehension of actual every-day work.

It had long been recognized that although the colleges and the universities were giving superb technical training, it was least attainable to the very people that needed it most. It was apparent that technical training was most valuable to the man that was working. With it, he could give the world more valuable service with less hard exertion; he could obtain better pay, and he could get proportionately greater enjoyment out of life. The average worker could not, however, relinquish the employment by means of which he was getting a livelihood for himself and those dependent on him.

Under the I. C. S. system of training, the student no longer stays away from work to go to school, nor stays away from school to go to work. The instruction goes to him wherever he works; he has a pleasant diversion in alternating his days of practice with evenings of theory; and he is trained to do his work better and easier as each day comes.

The success of correspondence instruction, however, is not assured by the mail service. It is not enough that the instruction goes to the student by mail. Success depends on *what sort* of instruction goes to him. The I. C. S. student receives all of the best instruction that is known in the trade or the engineering profession that he studies, and it is written so that it meets all of the requirements of training by mail.

Most of the Courses are reprinted and bound into substantial and handsome volumes. These volumes form a duplicate set of the Instruction Papers and Question Papers that are sent to the student throughout his Course, and they are furnished to him in addition to the Papers.

## Method of the I. C. S. Instruction

As soon as a student is enrolled, his first and second Instruction Papers and Question Papers are sent to him together with directions for studying. Information Blanks and addressed envelopes are also given to him.

The student studies the first Instruction Paper and works out the examples for practice. If he meets with any difficulty, he fills out an Information Blank (in which he gives full details of his difficulty) and sends it to the Schools. He then proceeds with his studies. He promptly receives a special explanation, written to remedy his particular difficulty; and he is encouraged to write for special information at any time.

After mastering the first Instruction Paper, the student takes up his first Question Paper and sends his answers to the Schools.

When answers are received at the Schools, the examples are corrected by women. These reviewers go over the student's work, checking all errors with red ink. The work then goes to our Principals and Instructors, who are skilled in their respective trades and professions. They give the student's technical work the final examination and criticism.



AN I. C. S. STUDENT READING

When an error is discovered, a careful correction of it is written on the back of the sheet. Special exercises and letters of explanation are sent to the student when necessary.

After being examined, the papers are entered on our books as passed, if a mark of 90 per cent has been attained—which is generally the case if the student has carefully studied his Instruction Paper. If his mark is below 90 per cent, he is required to review the incorrect portions until he masters them. The answers are then returned to the student, together with a Percentage Slip and the third set of Papers.

Our method always gives the student a Paper to study while we are correcting his work on a preceding Paper.

## Wanted: Superintendents, Overseers, and Designers

With the exception of silk, all of the principal raw materials used in the manufacture of yarns and cloth can be obtained in abundance in this country. We have the material, the machinery, and the markets. All that is required to make the United States the world's leader in textile manufacturing is an adequate supply of skilled millmen and designers to provide the quantity and quality of goods demanded by our rapidly increasing foreign and domestic trades.

There are hundreds of thousands of textile workers in the United States. Yet every textile manufacturer is hampered in his business by the lack of competent overseers and designers. There is no reason why any ambitious spinner or weaver should spend all of his days at the mule or the loom. Let him but add to his practical knowledge a training in the technics of textile design and manufacture, and he will be far better fitted for responsible and high salaried positions than the mill hand that depends on experience alone.

Do you want to be an overseer?

Do you want to be a designer?

Do you want to be a superintendent?

We can give you the technical training for any position that you want, and help you get the position.

Manufacturers of textiles find that it pays to employ only skilled workers—people that understand the scientific and artistic principles of what they have to do. Why? Because manufacturers must meet their competitors with the best possible fabrics, produced with the most economical methods, and they realize that money paid in high salaries to trained operators is, after all, the most profitable investment in the business.

There never has been a time when there was so great an opportunity for trained men in textile mills. Be up to date and do not wait years to learn by hard experience what we can teach you in much less time.

Your spare time is your capital. Invest it in the technical training that will enable you to win success.

The time lost in hesitating is lost forever.

Enroll for a Course today.

## Complete Cotton Course

This Course is to train people for the position of superintendent and agent, and is of great assistance to agents, superintendents, overseers, second hands, third hands, mechanics, spinners, loom fixers, weavers, and all other workers in cotton mills. The Course should be taken by salesmen in commission houses, jobbers, mill engineers, and machinery salesmen.

### Subjects Taught in This Course

Elementary Arithmetic	Warping
Mill Arithmetic	Sluicing
Shafting and Machinery Calculations	Drawing In
Yarn Calculations	Harness and Reed Calculations
Raw Cotton	Cloth Calculations
Mixing Cotton	Plain Weaving
Picking Machinery	Fancy Weaving, Including Dobby,
Carding	Jacquards, and Box Looms
Rolls and Roll Drafting	Principles of Designing
Railway Head	Fabric Analysis and Reproduction
Combers, Including Sliver and Ribbon	Cotton Mill Engineering
Lap Machines	Power Plants
Drawing Frames	Mill Planning
Fly Frames	Fire Protection
Ring Spinning	Heating, Humidifying, Lighting, and
Mule Spinning	Ventilation
Spooling	

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## Cotton Carding and Spinning Course

This Course is intended for yarn mill superintendents, boss carders, spinners, second hands, section hands, card grinders, and all employed in cotton yarn mills, or desiring to qualify for such positions. It is also recommended for cotton machinery erectors, yarn agents, cotton yarn merchants, hosiery mill superintendents, and others.

### Subjects Taught in This Course

Elementary Arithmetic and Mensuration	Rolls, Roll Drafting, and Draft Calculations
Definitions of Mechanical Terms	Railway Head
Principles of Roll Drafting	Combing, Including Sliver Lap and
Methods of Numbering Yarns	Ribbon Lap Machines
Rothing and Yarn Calculations	Drawing Frame
Machinery and Gearing Calculations	Fly Frames
Calculations Regarding Ply Yarns	Ring Spinning
Raw Cotton	Mule Spinning
Mixing Cotton	Miscellaneous Matters in Connection
Picking	With Carding and Spinning
Carding	

For details see the Complete Cotton Course synopses.



## Cotton Spinning and Warp Preparation Course

This Course is intended for superintendents of yarn mills, boss spinners, second hands and third hands in spinning rooms, overseers of beaming, slasher tenders, and all that desire to qualify themselves for positions of trust.

It is also recommended to cotton machinery erectors, yarn agents, and cotton yarn merchants.

### Subjects Taught in This Course

Elementary Arithmetic and Mensuration	Miscellaneous Matter in Connection With Spinning
Definition of Mechanical Terms	Spooling
Methods of Numbering Yarns	Warping
Roving and Yarn Calculations	Ball Warping
Machinery and Gearing Calculations	Beam Warping
Principles of Roll Drafting and Draft Calculations	Chain Warping
Ring Spinning	Slashing
Mule Spinning	

For details see the Complete Cotton Course synopses.

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## Cotton Warp Preparation and Plain Weaving Course

This Course is intended for superintendents of weave mills, boss weavers, fixers, second hands and third hands in weave rooms, weavers, slasher tenders, mill clerks, cloth commission agents, clerks, and salesmen.

It is also recommended to those that have a good knowledge of yarn mill machinery and desire to qualify for becoming general mill superintendents or for taking similar positions of responsibility.

### Subjects Taught in This Course

Elementary Arithmetic and Mensuration	Slashing
Definitions of Mechanical Terms	Plain and Twill Weaving
Methods of Numbering Yarns	Picking Motions
Roving and Yarn Calculations	Let-Off Motions
Machinery and Gearing Calculations	Take-Up Motions
Spooling	Filing-Size Motion
Warping, Beaming, Ball Warping, Beam Warping, and Chain Warping	Draper Loom
	Loom Fixing

For details see the Complete Cotton Course synopses.

## Fancy Cotton Weaving Course

This Course is intended for designers and assistant designers, agents, superintendents, overseers, and second hands in weave rooms, section hands, loom fixers, and weavers.

### Subjects Taught in This Course

Arithmetic	Let-Off, Take-Up, and Filling-Stop Motions
Mensuration	Draper Loom
Shafting, Pulley, and Gear Calculations	Fancy Weaving
Yarn Calculations	Dobbies
Cloth Calculations	Drop-Box Looms
Warp Preparation	Jacquard Weaving
Plain Weaving	Cloth Room Machinery
Picking Motions	

For details see the Complete Cotton Course synopses.

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## Cotton Carding, Spinning, and Plain Weaving Course

This Course is intended for those that do not desire to take the full Cotton Course and are not interested in the manufacture of fancy cloth. Any one that now holds or desires to qualify for the position of superintendent or of overseer in mills making plain cotton goods will find it just what is needed.

It is especially recommended to second hands and third hands, fixers, weavers, slasher-tenders, shipping clerks, master mechanics, mill engineers, and draftsmen, machinery salesmen, and all that are employed in cotton mills.

### Subjects Taught in This Course

Elementary Arithmetic and Mensuration	Fly Frames
Definitions of Mechanical Terms	Ring Spinning
Methods of Numbering Yarns	Spooling
Roving and Yarn Calculations	Warping, Including Ball Warping,
Calculations Regarding Ply Yarns	Beam Warping, and Chain
Raw Cotton	Warping
Mixing Cotton	Slashing
Picking	Plain and Twill Weaving
Carding	Picking Motions
Principles of Roll Drafting	Let-Off Motions
Calculations Regarding Drafts	Take-Up Motions
Railway Head	Filling-Stop Motions
Combing, Including Sliver and Ribbon	Draper Loom
Lap Machines	Loom Fixing
Drawing Frame	

For details see the Complete Cotton Course synopses.

## Complete Textile Designing Course

This Course is intended for designers and assistant designers, agents, superintendents, overseers, and second hands in weave rooms; section hands, loom fixers, and weavers in cotton, woolen, worsted, or silk mills; dry goods merchants, salesmen in commission houses, jobbers, and all persons interested in textile designing, or desiring to qualify for any of the foregoing positions.

This is the best Course ever prepared on textile designing. It embraces all of the instruction that pertains to the subject.

### Subjects Taught in This Course

Elementary Arithmetic	Reversible Fabrics
Mill Arithmetic	Jacquard Designing
Shafting and Machinery Calculations	Use of Color
Cloth Calculations	Principles of Coloring
Designing Materials	Color Effects
Elements of Designing	Colored Stripes, Checks, and Spots
Harness and Chain Drafts	Warp Preparation Machinery
Cloth Dissection and Reproduction	Looms, Including Plain, Dobby, Drop-Box, and Jacquard Looms
Plains, Twills, and Satins	Cloth Room Machinery
Fancy Single Fabrics	Commercial Requirements of a Designer
Combinations of Weaves	
Backed and Double Fabrics	

For details see the Textile Designing Course synopses, which begin on page 22.

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## Theory of Textile Designing Course

This Course is intended for men that have a good knowledge of warp preparation and weaving machinery, but whose knowledge of the theory of designing is not complete.

It is strongly recommended to boss weavers, overseers, second hands, and others that desire instruction in the analysis and reproduction of fabrics and drafting of designs.

### Subjects Taught in This Course

Mill Arithmetic	Fancy Single Fabrics
Yarn Calculations	Combination of Weaves
Cloth Calculations	Backed and Double Fabrics
Use of Designing Materials	Reversible Fabrics
Elements of Designing	General Designing Instructions
Harness and Chain Drafts	Cloth Dissection and Reproduction
Plains, Twills, and Satins	

For details see the Complete Designing Course synopses.

## Cotton Designing Course

This Course is intended for designers and assistant designers, agents, superintendents, overseers and second hands in weave rooms, section hands, loom fixers, weavers, in cotton mills; dry goods merchants, salesmen in commission houses, jobbers, and all men and women interested in cotton designing or desiring to qualify for any of the foregoing positions.

There is a broad field for designers. The demand for new figures in fabrics is ever increasing, and there are altogether too few men competent to produce good work.

This Course is written in a simple and comprehensive style, and gives the technical details of designing so that any ambitious student can readily understand them and their application in the manufacture of textile goods.

### Subjects Taught in This Course

Arithmetic	Design on Point Paper
Mensuration	Drafting
Shafting, Pulley, and Gearing Calculations	Analysis of Fabrics
Yarn Calculations	Plain Cloth
Cloth Calculations	Satins
Warp Preparation	Mat or Basket Weaves
Plain Weaving	Re-arranging Twills
Picking Motions	Diagonal Patterns
Lee-Off, Take-Up, and Filling Stop Motions	Fancy Goods
Draper Loom	Backed Fabrics
Fancy Weaving	Leno
Dobbies	Textile Coloring
Drop-Box Looms	Color Contrasts and Harmonies
Jacquard Weaving	Analyzing Colored Sketches
Cloth-Room Machinery	Colored Stripe Patterns
Harness Calculations	Colored Checks
	Designing and Reproduction of Fabrics

For details see the Textile Designing Course synopses, which begin on page 22.

# Synopses of Subjects

TAUGHT IN THE

## I. C. S. Complete Cotton Course

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### Section A

**Machinery and Yarn Calculations:** Definitions and Rules; Arithmetic, including Fractions, Proportion, Percentage, and Square Root; Definitions of Terms Used in Mensuration; Diameter, Radius, and Circumference of Circles; Angles; Rules for Finding Areas of Plane Figures, Surfaces, and Contents of Cylinders, Cubes, and Other Forms; Definitions of Mechanical Terms; Shifting, Pulleys, and Gears; Rules for Finding Speeds of Driven Shafts and Gears; Speed Calculations; Roving and Yarn Calculations; Method of Numbering Cotton Yarns; Method of Numbering Other Yarns; Conversion of One System into Another; Ply Yarn; Method of Numbering Ply Yarn; Method of Calculating Numbers of 2, 3, 4, or More Ply Yarns; Sizing or Reeling Roving or Yarns; Miscellaneous Calculations.

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### Section B

**Raw Cotton:** Botany of Cotton; Structure and Composition of Fiber; Cotton and Cotton Fields; Varieties of American Cotton and Their Suitability for Different Yarns; Other Cottons and Their Special Purposes; Recognition of Different Kinds of Cotton; Grading Cotton; Faults in Cotton and Their Detection; Selection of Cotton for Different Yarns; Growth and Cultivation of Cotton; Ginning, Baling, and Pressing; Proportions of the Lint to the Seed; Commercial Handling of Cotton; Testing Cotton; Gain and Loss in Cotton.

**Mixing:** Reasons for the Methods of Mixing; Advantages and Disadvantages of Different Systems; Object of Blending Cotton; Combinations of Different Varieties of Cotton for Special Purposes; Construction, Use, Capacity, and Cost of Blade Breaker or Cotton Puller; Arrangement and Construction of Picker Rooms; Automatic Feeders; Construction, Capacity, and Cost of Different Feeders; Speeds and Setting of Different Pairs of Feeders; Changing for Special Purposes.

**Openers:** Principles, Use, and Object; Construction; Capacity; Calculating and Changing Drafts and Lengths of Laps; Adjusting of Parts; Trunks and Connections; Different Methods of Constructing.

**Intermediate and Finisher Lappers:** Construction of Beaters; Setting of Parts and Regulating of Waste; Regulating of Air Currents; Constructing of Eveners; Production of a Good Lap; Alterations; Care of Picker Machinery and Picker Rooms.

**Carding:** Advantages of Carding; Different Methods; Construction of Cards; Advantages and Disadvantages of Each System; Suitability of Each System for Special Purposes.

**Revolving Flat Cards:** Construction of the Feed, Licker, Cylinder, Doffer, Collet, Flats, Screens, and Other Parts; Setting of Each Part; Card Clothing; Different Methods of Numbering Card Clothing; Grinding; Construction and Use of Grids; Stationary Top Flat Cards; Method of Stripping Cards; Production of Cards and Card Waste; Management and Operation of Card Rooms; Accessory Appliances.

**Roll Drafting:** Principle of Drawing Slivers; Construction of Rolls; Covering of Rolls; Weighing; Construction, Weighting, and Drafting Calculations of Metallic Rolls; Setting Rolls; Clearers; Yarnishing; Seaming Rolls; Draft Calculations; Doublings; Calculations of Draft Gears; Constants for Drafts; Change Gears; Changing Drafts.

**Railway Head:** Object, Use, Advantages, and Disadvantages of the Railway Head; Single Heads and Double Heads; Drawing Rolls; Figuring Drafts and Changes; Construction of the Eeener; Stop Motions.

**Machines Used in Connection With Combers:** Preparation of Laps for Combers; Construction of the Sliver Lap Machine; Calculations; Construction of the Ribbon Lap Machine on American and English Principles; Setting and Adjusting Calculations.

**Combers:** Principles of Cotton Combers; Single-Nip and Double-Nip Combers; Construction of the Ordinary Comber; Feed-Rolls; Nippers; Needles; Top Combs; Detaching Mechanism; Caps; Setting of Combers; Care and Operation of Combers; Draft in Sliver and Ribbon Lappers and Combers; Defects in Combed Work; Remedies; Operation and Management of Combers.

**Drawing Frame:** Principles of Drawing Slivers; Objects Desired in the Construction and Use of the Drawing Frame; Sizes and Arrangements of Drawing Rolls; Weighting; Gearing; Figuring Drafts and Changes; Front, Back, and Other Stop Motions; Electric Stop Motions; Mechanical Stop Motions; Pull-Cam and Roll-Lap Stop Motions; Cost and Capacity.

**Fly Frame:** Spacers, Stubbers, Intermediates; Roving, Fine, or Jack Frames; Usual Construction of the Modern Fly Frame; Principle and Operation; Driving of the Bobbin and the Spindle; Formation of a Bobbin; Traverse Motion; Builder Motion, and Full Bobbin Stop Motion; The Compound and Its Objects; Theory of the Formation of a Bobbin; Draft Rolls; Figuring and Changing Draft; Twist, Lay, and Other Gears; Calculations of Twist; Faults in Fly Frames and Their Correction; Variations From Usual Construction of Frame.

**Spinning:** Different Methods; Ring, Flyer or Throstle and Mule Spinning; Construction of a Ring Spinning Frame; Description of the Frame; Different Kinds of Spindles and Their Speeds; Rings, Travelers; Builder Motions; Separators; Roll Stands; Rolls; Clearers, and Other Parts of a Ring Frame, and Their Modifications for Special Purposes; Miscellaneous Points in Connection With Ring Frame Spinning; Banding; Cleaning, Oiling, and Dulling; Calculations and Production Tables; Operation and Management of Spinning Rooms.

**Spinning Mule:** Construction, Use, and Operation; Principle; Construction and Propulsion of Carriage and Spindles; Construction and Operation of Drawing Rolls; Construction and Use of a Cam Shaft and Cams; Sequence of Movements in the Mule; Winding Motions; Backing-Off Mechanism; Building of the Crib; Copping Rail; Miscellaneous Points in Connection With Mule Spinning; Care and Attention Required in Mule Rooms; Calculations.

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## Section C

**Spinning:** Different Methods; Ring, Flyer or Throstle, and Mule Spinning; Construction of a Ring Spinning Frame; Description; Different Kinds and Speeds of Spindles; Rings, Travelers; Builder Motions, and Separators; Roll Stands, Rolls, Clearers, and Other Parts of a Ring Frame; Their Modifications for Special Purposes.

**Spooler:** Construction, Use, Speeds, and Dimensions; Spindle, Bobbin Holder, Thread Guide, Builder Motion, and Other Parts; Faults in Spooling and Their Remedies; Management; Cost and Capacity of Machines.

**Beam Winding:** Construction of a Warper; Creels, Combs, Stop Motions, and Measuring Motions; Good Beams and Bad Beams; Correction of Faults; Speed; Cost and Capacity of Machines.

**Slashing:** Objects of Slashing; Usual Construction of Slasher, Including Creels, Size Box and Rolls, Cylinders, Head Motion, Slow Motion, and Steam Traps and Valves; Faults in Slashing and Their Correction; Mixing of Size; Size Kettles; Different Slazing Ingredients and Their Suitability for Special Purposes; Variation in the Method of Preparing Wurns, Including Descriptions of Rail Warpers, Beamer's Dressing Frames, Hand Winding, and Chain Winding.

**Plain and Twill Weaving:** Construction of Plain Loom; Principal Movements in Weaving; Shedding Motions; Method of Shedding; Shedding by Cams; Varieties of Cams; Auxiliary Shafts.

**Picking Motions:** Different Methods of Picking; Shuttles; Shuttle Boxes; Shuttle Guards; Tight and Loose Reed Looms; Protector Motions; Brakes; Reeds; Use of the

Reed; Beating Up; The Lay and Its Construction; Method of Obtaining the Eccentricity of the Lay; Long and Short Cranks; Let-Off Motions; Take-Up Motions; Their Connection With Let-Off Motions; Various Makes of Take-Up Motions; Change of Pick Gears; Filling; Stop Motions, Side and Center; Their Construction and Operation; Various Temples and Their Uses;

**Draper Loom:** Special Features; Operation of Magazine, Stop Motion, and Other Special Features; Special Features of Various Makes of Looms; Management, Operation, and Fixing of Looms; Putting in Warps; Faults and Their Remedies in Weaving and Fixing; Calculations Directly Connected With Plain Weaving.

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## Section D

**Plain Weaving:** Construction of a Plain Loom and Variations From the Usual Forms of Construction; Usual Parts of a Plain Loom, Including Lay, Cam, and Harness Motion; Picking Motion, Take-Up Motion, Let-Off Motion, Temples, and Protectors; Starting Looms; Putting in Warps; Loom Fixing and Weaving; Draper or Northrop Loom; Its Construction and Use; Other Plain Looms.

**Fancy Weaving:** Looms Adapted to Weave Twills and Satins; Looms for the Use of Various Colors and Fillings; Drop-Box Motions; Multipliers; Building of Chains for Boxes.

**Dobbies:** Looms Adapted for Weaving Fancy Cloth With Dobbies; Witches; Single and Double Lift Dobbies; Dobbies With Single and Double Cylinders; Chain Building for Dobbies; Under Motions for Dobbies; Looms Using Dobbies Combined With Other Motions for Special Purposes, Such as Leno Looms.

**Jacquard Weaving:** Principle of Construction of Jacquards; Single Lift and Double Lift Jacquards; Jacquard Machines With One Cylinder; Jacquard Machines With Two Cylinders; Harness; Lingoes; Counter Board; Tying Up Jacquards; Varnishing; Couplings; Straight Lay, Over, and Center Ties; Leno and Pressure Harness; Cross Border and Other Jacquard Machines.

**Cloth Room Machinery:** Cloth Trimming and Inspecting Machinery; Cloth Folders; Cloth Brushing; Doubling and Rolling Machines; Shearing Machines; Presses; Arrangement and Operation of a Cloth Room.

**Designing:** Designing of All Kinds of Cotton Fabrics; The Various Classes of Fabrics; Representation of Fabrics on Paper; Design Paper and Its Uses; Methods of Obtaining Patterns.

**Harness and Chain Drafts:** Harness Drafts and Their Representation on Paper; Methods of Obtaining Harness Drafts; Chain Drafts and Their Representation on Paper; Methods of Obtaining Chain Drafts.

**Analysis of Fabrics:** Particulars to Be Obtained by Analysis and Methods of Obtaining Them; Most Expeditiously and Advantageously; Dissection of Ply Fabrics as Compared With Dissection of Single Fabrics.

**Twills:** Fabrics Usually Made by Harnesses; Satins; Fancy and Diagonal Twills; Combinations and Rearrangement of Twills.

**Fancy Goods:** Fancy Goods Other Than Plain Goods and Twills; Leno; Gauze; or Cross Weaving; Leno Weaving From 1, 2, and 3 Beams; Cloth Made or Ornamented With Extra Warp or Filling; Bedford Cords; Pique; Imitation Leno; Figured Muslin; and Dimity.

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## Section E

**Mill Engineering:** Conditions Leading to the Erection of Mills; Advantages of Various Locations; Best Soils for Foundations; Type of Building Most Suitable for Textile Purposes; Discussion of the Construction of a Model Mill, Including the Best Method of Building Foundation, Supporting Floors, and Roof Work; Etc.; Iron Columns and Wooden Columns; Location of Fire Walls; Constructions Required by Mutual Insurance Companies; Power Generation; Water Power, Including Descriptions of Most Improved

Types of Turbines; Steam Power; Return-Tube Boilers; Water-Tube Boilers; Plain Slide-Valve Engines; Corliss Engines; Heating, Including the Direct Systems and Indirect Systems; Systems Suitable for Southern Mills and Northern Mills; Ventilation; Lighting, Including Gas Lighting and Electric Lighting by Both the Arc and the Incandescent Systems; Plumbing and Humidifying; Fire Prevention, Including Sprinkler Systems and Apparatus Required by the Mutual Fire Insurance Associations; Production of Each Machine in the Mill When Making a Certain Number; List of Machines Required in Order That the Production of Each Process Shall Balance That of Others; Space Occupied by Each Machine; Cost of Each Machine; Figuring the Cost of a Plant Having a Certain Number of Spindles.

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## Section F

**Cotton Specialties:** Special Plants for Hosiery Yarn Manufacture; Special Plants for Thread Manufacture; Uses of Dyed Stock; Opening, Carding, and Spinning; Manufacture of Fancy Yarns From Dyed Stock and Blends; Condensed, Imitation Wool, or Wigogue Yarns, and Their Manufacture; Utilization of Waste From Cotton Machinery.

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## Section G

**Calculations for Fabrics:** Calculations for Length and Weight of Warp or Filling in Different Cloths; Calculations of Ends and Picks; Calculations of Quantity of Material in Other Than Plain Fabrics; Harness and Reed Calculations; Getting Out Particulars for Warping and Slashing of Warps.



# Synopses of Subjects

TAUGHT IN THE

## I. C. S. Textile Designing Course

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### Section A

**Arithmetic:** Arithmetical Definitions and Rules; Arithmetic, Including Vulgar and Decimal Fractions, Proportion, Percentage, and Square Root; Definitions of Terms Used in Mensuration; Rules for Finding Areas of Surface and Contents; Diameter, Radius, and Circumference of a Circle; Measurement of Angles; Definitions of Mechanical Terms.

**Shafting, Pulleys, and Gears:** Rules for Finding the Speeds of Driven Shafts and Gears; Rules for Finding the Speeds of Driving Shafts and Gears; Rules for Finding the Sizes of Pulleys or Gears to Give Specified Speeds; Calculations Regarding Changes of Speeds of Driving or Driven Gears or Shafts; Leverage.

**Yarn Calculations:** Methods of Counting or Numbering Various Yarns, Cotton, Woolen, Worsted, Linen, and Silk; Conversion of One System Into Another; Sizing, Wrapping or Reeling Yarns; Miscellaneous Calculations Regarding Yarns; Calculations Regarding the Weight of a Given Length and Counts of Yarn, the Counts of a Given Length and Weight of Yarn, and the Length of a Given Count and Weight of Yarn; Double and Twist or Ply Yarn; Method of Numbering; Method of Calculating the Counts of 2, 3, 4 or More Ply Yarns; The Counts of Ply or Folded Yarn, Whether of Two or More Sizes, or Two or More Materials; Cost of Ply Yarns; Rules for Finding the Weight of Single Yarns Required to Produce Specified Ply Yarns.

**Cloth Calculations:** To Find the Counts of Yarn on a Beam; To Find the Number of Ends on a Beam; To Find the Weight of Yarn on a Beam, Bobbin, or Spool; To Find the Length of Warp Yarn on a Beam; To Find the Average Number of Warp Yarn When More Than One Count is Used; To Find the Number of Ends of Each Color of Yarn on a Beam; To Find the Necessary Number of Needles on Each Harness to Weave Any Count of Cloth; To Find the Total Ends in a Cloth; To Find the Total Number of Ends of Each Count in the Cloth When Different Counts, Colors, or Materials Are Used; To Find the Percentage of Warp Contraction During Weaving; To Find the Dents Per Inch in the Reed; To Find the Width Occupied by the Warp Yarn in the Reed; To Find the Amount of Warp Yarn Required to Weave a Cut of Cloth of Any Length; To Find the Amount of Filling Yarn Required to Weave a Cut of Cloth of Any Length; To Find the Yards Per Pound That the Cloth Will Weigh; To Find the Average Counts of Yarn in a Piece of Cloth; To Find the Counts of Filling That Are Required to Make a Cloth Any Desired Weight, the Counts of the Warp Yarn Being Known.

A sample of cloth is included with these cloth calculations, and each rule that is given is worked directly from data given in connection with the cloth sample, thus enabling the student to figure the specifications for any cloth that may be met with.

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### Section B

**Designing and Reproducing of Fabrics:** Definition of Designing; The Structure of Woven Fabrics; Special Characteristics of Different Materials and Yarns, Cotton, Woolen, Worsted, Linen, and Silk; Various Builds of Fabrics, and the Principles of Intertexture Suitable for Certain Classes of Fabrics, in Contrast with Weaves for Other Classes; Points to Be Considered When Combining Weaves; Weaves That Take Varying Amounts of Filling, and Weaves That Take Up the Warp at Different Rates; Combining Weaves for Stripes; Combining Weaves for Checks.

**Fancy Goods:** Fancy Goods Other Than Plain and Twills, Leno, Gauze, or Cross Weaving; Leno Weaving From 2, 2 and 3 Reams; Checks Made or Ornamented With Extra Warp or Filling, or Both; Bedford Cord; Plain Imitation Leno and Dimity.

**Designing as Especially Adapted to Cotton Fabrics:** Plain Weave; Twills; Weave Designs; Down or Across the Piece; Pointed Twills; Stripes; Spot and Diamond Figures; Satins; Broken Twills; Weaves Derived from Satins and Twills, Such as Granite Weaves; Combination and Corkscrew Twills; Honeycombs; Mock Lenos; Dice and Diaper Patterns; Repps; Plain and Figured; Bedford Cards;

**Backed and Double Fabrics:** Filling Backed Fabrics; Warp Backed Fabrics; Double Cloth; Figured Double Plain Cloths; Heavy Ply Cloths; Embossed Fabrics; Piques; Welts; Etc.; Figuring With Extra Filling; Figuring With Extra Warp;

**Designing as Especially Adapted to Woolen and Worsted Fabrics:** Relative Advantages of Hard and Soft Spun Yarns, and the Relative Influences of Right and Left Twists; Characteristics and Designing of Meltons; Doeskins; Buckskins; Venetians; and Other Fine Twilled Cloths;

**Backed Fabrics:** Filling Backed Fabrics; Warp Backed Fabrics; Proper Methods of Stitching the Face to the Back, or the Back to the Face in Both Warp and Filling Backed Designs; Effects of Improper Stitching; Relative Advantages of Backing With Warp and Backing With Filling;

**Double Cloth:** Its Relative Advantages With Backed Goods; Methods of Constructing Double Cloth Weaves and of Indicating Them on Design Paper; Cloths Constructed With One Face and One Back; With Two Face and One Back; and With Three Face and One Back in Both Warp and Filling; One Face and One Back in the Warp; With Two Face and One Back in the Filling; Two Face and One Back in the Warp; With One Face and One Back in the Filling; Two Face and Two Back in Both Warp and Filling; Rules for Stitching Double Cloth; How the Fabric is Affected by Imperfect Stitching; Double Fabrics, in Which the Face Pattern is Partly Produced by Stitching the Two Cloths Together; Three or More Ply Fabrics;

**Reversible Cloth:** Backed and Double; Relation of the Pattern in Each Cloth, Face and Back, to Facilitate Stitching; Figuring With Two Cloths by Passing One Through the Other; Structure of Double Plain Fabrics for Hairlines, Stripes, Checks, and Figured Fabrics;

**Designing in General:** Structure of all Descriptions of Compound Fabrics;

**Pile Fabrics:** Warp and Filling Pile; Cut and Uncut Piles;

**Leno:** Structure and Designing of Gauze and Leno Fabrics of Various Kinds;

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## Section C

**Textile Coloring:** Theories of Coloring; Complementary Colors; Colors as Seen in Different Lights; Methods of Modifying or Changing Colors; Tinting and Shading Colors; Attributes of Primary, Secondary and Tertiary Colors; and Their Derivatives; Qualities of Colors;

**Color Contrasts:** Colors in Relation to Light and Dark Grounds; Effects of Juxtaposition or Association of Colors; Factors That Modify the Coloring of Textiles; Color in Relation to Different Types of Weaves Used for the Production of Textile Fabrics;

**Color Harmony:** Color Effects; Principles of Applying Color to Weave Designs; Sketching of Patterns Owing to Combining Colored Yarns in Single Weaves; Arrangements of Different Colors in Warp and Filling to Produce Certain Effects; Weave in Relation to Color Development; Striped, Checked and Spotted Effects Produced With the Plain Weave, Regular Twills, Satins, and Small Single Weaves, by Coloring; Checks Produced by Various Systems of Filling Colorings in the Simple Warp Colorings; Simple and Compound Colorings;

**Analyzing Colored Sketches:** Color Effects; Color as Applied to Stripes and Checks; Coloring Combination Designs; Coloring Spotted Designs; Color in Relation to Special Weaves, Such as Warp Face Weaves, Filling Face Weaves, Rib or Cord Weaves; Color;

**Colored Stripe Patterns:** Regular Stripes; Hairlines; Stripes in Two Shades; Stripes in Three or More Shades; Irregular Stripes; Studded Stripes; Stripes Composed of Two

or More Orders of Coloring; Points to Be Observed When Making New Styles; Effects of Not Maintaining Balance of Contrast.

**Colored Checks:** Checks Composed of Two Colors; Checks Composed of Three or More Colors; Shaded and Irregular Checks; Common Checks; Fancy Checks; Overchecks; Counterchange Checks; Compound Checks; Graduated Checks; Gingham, Plaids, Tartans; Broken Checks; Principles of Coloring Warp and Filling; Rib Weaves; Double Plain Weaves; Warp and Filling Cockscrews, Outings, and Oxford Stripes.

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## Section D

**Warp Preparation and Weaving Machinery:** Various Systems of Preparing Warps for Cotton, Woolen, Worsted, and Other Materials; Spoolers, Wappers, Dressers, Slashers, and Beaters; Drawing-In Warps.

**Plain Weaving:** Plain Loom; Construction of the Plain Loom; Principal Movements in Weaving; Shedding Motions; Methods of Shedding; Shedding by Cam; Auxiliary Shafts; Varieties of Cams; Construction of Cams.

**Picking Motions:** Different Methods of Picking; Shuttle; Shuttle Boxes; Binder; Tight and Loose Reel Looms; Protector Motions; Brakes; Reels; Use of the Reel; Beating Up; Lay and Its Construction; Method of Obtaining the Eccentricity of the Lay; Long Cranks and Short Cranks.

**Let-Off Motions:** Bartlett, Thompson, Morton, Shepard, and Other Let-Off Motions.

**Take-Up Motions:** Their Connection With the Let-Off Motion; Various Makes of Take-Up Motions; Changing the Pick Gears.

**Filling Stop Motions:** Side and Center; Their Construction and Operation; Various Makes and Uses of Temples.

**Draper Loom:** Special Features of Its Construction; Operation of the Magazine, the Filling-Stop Motion, and Other Parts of This Loom.

**Fancy Weaving:** Looms Adapted to Weave Twills and Satins; Looms for the Use of Various Colors of Filling; Drop Box Motions; Circular Boxes; Multipliers or Repeaters; Building of Chains for Boxes.

**Dobbies:** Looms Adapted for Weaving Fancy Cloth With Dobbies; Witches; Single Dobbies; Double Acting Dobbies; Dobbies With Single and Double Cylinders; Chain Building for Dobbies; Under Motions for Dobbies; Looms Using Dobbies Combined With Other Motions for Special Purposes, Such as Leno Looms, and Others.

**Looms:** Loom Especially Adapted for Woolen and Worsted Goods; Open and Close Shed Looms; Shedding Motions or Head Motions; Pick and Pick Looms.

**Jacquard Weaving:** Principle and Construction of Jacquards; Single and Double Lift Jacquards; Jacquard Machines With One and Two Cylinders; Harnesses; Lingoet Comber Board; Picking Up Jacquards; Varnishing; Couplings; Straight Lay Over and Center Ties; Leno and Pressure Harnesses; Cross Boxer and Other Jacquard Machines.

**Cloth Room Machinery:** Cloth Trimming and Inspecting Machinery; Cloth Folders; Cloth Brushing; Doubling and Rolling Machines; Shearing Machines; Presses; Arrangement and Operation of a Cloth Room.

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## Section E

**Commercial Requirements of a Designer:** Methods of Designing With a Minimum of Expense; Equipment of a Designing Room; Apparatus Required; Methods of Keeping Records; Machinery for Producing Samples; Preparation of Small Warp; Pattern Weaving; Methods of Obtaining Advance Patterns of European and Other Novelties; Fashionable Styles; Cycles of Returning Fashions.

# I. C. S. Students' Aid Department



**T**HE STUDENTS' AID DEPARTMENT was established in 1898 to further the employment interests of I. C. S. Students. The services of this Department are rendered free of charge. Its purpose is twofold: to help students in their present positions; and to assist them in securing new positions.

**HELPING STUDENTS IN THEIR PRESENT POSITIONS**—A handsome engraved Certificate of Progress is awarded to the student for every subject that he completes. The Certificate is signed by his Principal and is issued under the seal of the International Correspondence Schools. If the student so desires, we will give notice of his progress to his employer, superintendent, foreman, or any other person. This notice of progress is one of the chief benefits that this Department gives to I. C. S. students, in that it shows the employer how his employes are training for greater responsibilities. When opportunities for promotion arise, students thus recommended will receive much more favorable consideration.

**ASSISTING STUDENTS IN SECURING NEW POSITIONS**—The student will be much benefited by having his prospective employer advised of his progress. On the request of the student, this Department will write to any firms to whom he has applied for employment, stating the training that he has received from the International Correspondence Schools. When a student has completed the first subject in his Course, we will at his request give him a general letter of recommendation, which he may show in personally applying for employment.

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# What the International Correspondence Schools Train People In

Architectural Drawing  
and Designing  
Building Contracting  
Commercial Work  
Stenography  
Bookkeeping  
Chemistry  
Ornamental Designing  
Drawing and Sketching  
Lettering and Sign  
Painting  
Sheet-Metal Pattern  
Drafting  
Mechanical Drawing  
Electrical Engineering  
Telephone Engineering  
Telegraph Engineering  
Electric Lighting  
Electric Railway  
Operating  
Dynamo Running  
Interior Wiring

Electric Car Running  
Civil Engineering  
Railroad Engineering  
Surveying and Mapping  
Bridge Engineering  
Municipal Engineering  
Hydraulic Engineering  
Cotton Manufacture  
Woolen Manufacture  
Fabric Designing  
Engine Running  
Engine and Dynamo  
Running  
Marine Engineering  
Locomotive Running  
Teaching  
Electrotherapeutics  
Dental Electrothera-  
peutics  
Roentgen Rays  
Navigation  
English Branches

Spanish  
German  
French  
Mechanical Engineering  
Mechanics  
Machine Shop Practice  
Toolmaking  
Patternmaking  
Foundry Work  
Blacksmithing and  
Forging  
Farming  
Gas Engine Running  
Refrigerating  
Coal Mining  
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Gas-Fitting  
Heating and Ventilating  
Locomotive Mechanics  
Air Brake Operation  
Train Running

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