THE TRAINING OF THE MODERN SHOP SUPERINTENDENT.

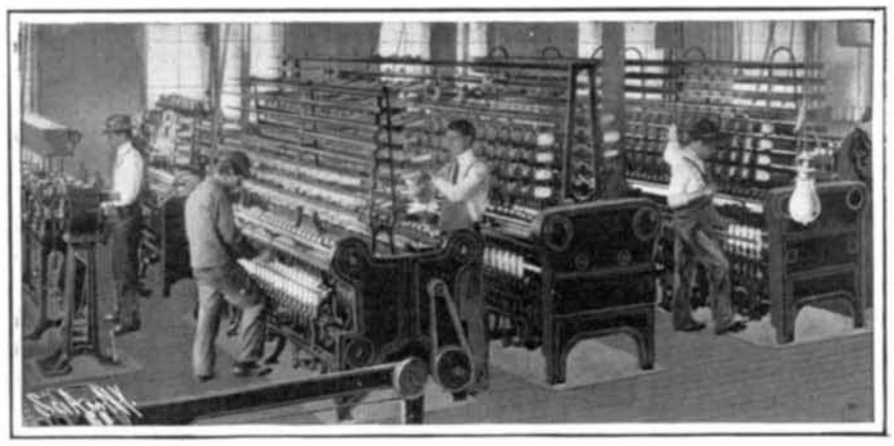
BY CHARLES C. JOHNSON.

It has come to be a popular belief that textile, mechanical, and electrical engineering and allied knowledge, as taught in schools devoted to imparting such facts, is largely theoretical. Indeed, the statement is not infrequently heard that this mill superintendent or that mechanical engineer is a practical man, because he went through a systematic course of labor in an establishment like that of which he is now the head.

It would be difficult to point out a more total misunderstanding of fact. The technical school of to-day is now, or is rapidly becoming, as practical as the mill, the smithy, the machine shop, or any other place within the domain of a captain of industry.

In the most advanced of these technical schools there is among the students a considerable element repre-

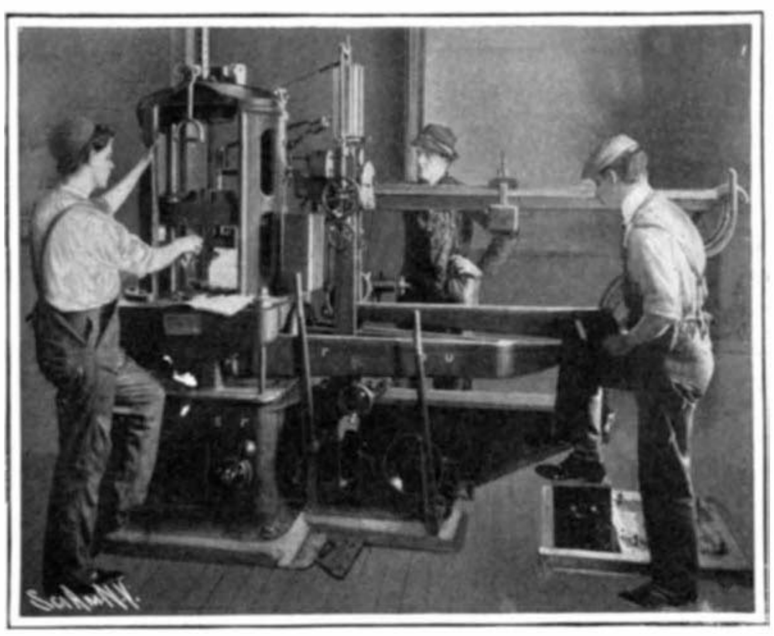
Quantitative Analysis in the Laboratory.



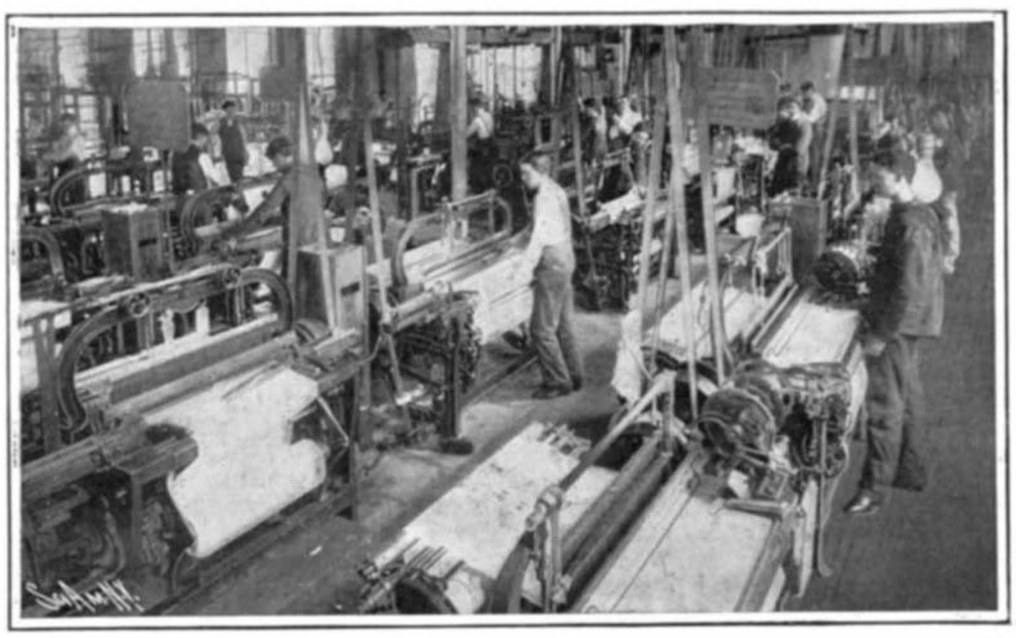
Students Operating Cone Winders and Twisters.

Casting and Molding in the Iron Foundry.

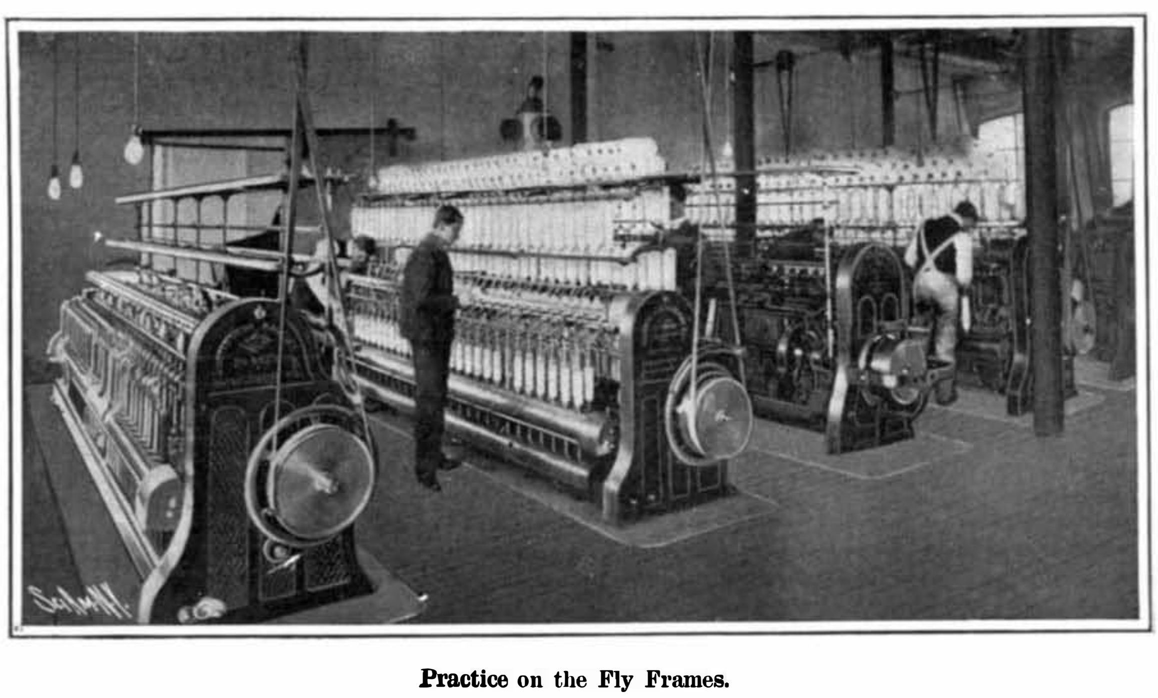
Ring Spinning.



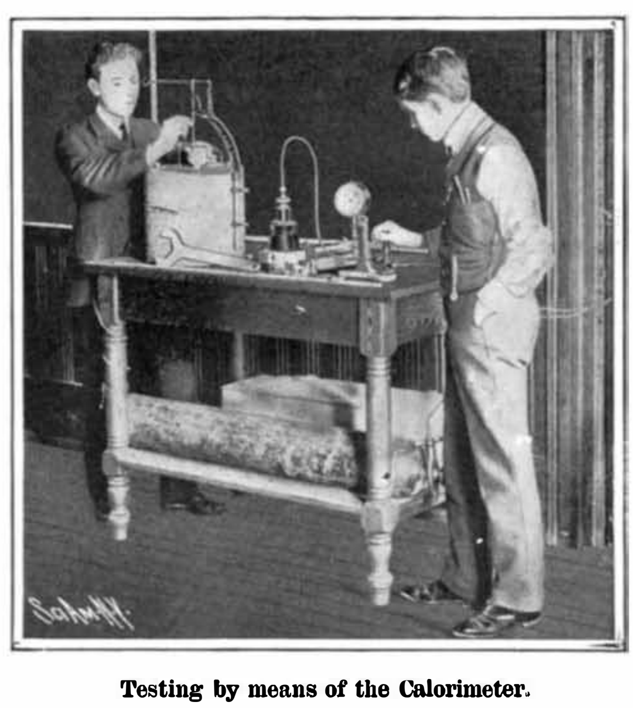
Testing Steel with a 100,000-Pound Automatic Machine.



Power Loom Practice.



Practice on the Fly Frames.



Testing by means of the Calorimeter.

THE TRAINING OF THE MODERN SHOP SUPERINTENDENT.

senting the mill and shop owners who have sent their ambitious sons and successors-to-be to these institutions, realizing that the instruction there given is equally practical and far more thorough than is obtained in their own mills or shops, besides including a host of things that neither weave room nor machine shop can teach.

No man of intelligence denies that theoretical courses are of primary importance in affording mental discipline not to be derived from practical research. So in these schools, theory and practice are made to go hand in hand, on the basis that from continual and practical applications of theoretical conclusions a broader and more tangible conception of their truths may be derived.

An excellent example of the practical plane the technical school has gained is Georgia's State School of Technology. The manufactures resulting from the work of the students, where the product is not for the use of the school itself, are sold, just as the output of any other producing plant is disposed of. The student understands from the first that his work is practical, and he is required to exercise the same energy and skill he would devote to his task if his daily bread depended on the result of his efforts.

The growth of the textile industry in the Southern States has resulted in an increasing demand for executive mill men, superintendents, and others, who combine with the practical training the mills give that knowledge which runs to cause and effect, what may be called the higher education in textile matters, including a sound foundation in engineering subjects.

So the technical-school course includes, besides the usual subjects of the textile school—such as carding, spinning, weaving, designing, and dyeing—extensive courses in chemistry, physics, mechanics, drawing, strength of materials, steam engine, electrical work, mill construction, and shop work.

How the Bicycle is Ridden.

End View of the New Bicycle.

THE LATEST IN CYCLES.

The course not only covers the theoretical sides of the different subjects, but is extremely practical. For example, with a few exceptions where very fine or fancy yarns are required, students make and dye all the yarn used in the weave room. This yarn and the cloth product are kept up to the standard as jealously as in the mills of the highest class, because the product is placed on the market and sold.

The subject of fabric structure is given especial attention in its relation to the different combinations of textures and weaves, the classification of fabrics, the "balance of cloth" necessary to give the maximum of wearing qualities, and best general appearance, influence of twist in the appearance of the fabric and on textures, the influence of the texture on the appearance of the weave.

Formation of fabrics by interlacing threads introduced at right angles is included in the instruction in fabric design, as well as the three foundation weaves, the plain or cotton weave, the production of fancy effects on a plain weave foundation, the various features of twills and satins. All these, and much that is taught beside, enable a student to learn the origin and application of all the simpler weaves used in designing the various classes of textile fabrics.

Every effort is also made to familiarize the student with the rules and best systems of cloth analysis. He is furnished with samples of every grade of cotton fabrics, and his analyses thereof are thorough.

As a preliminary to carding and spinning instruction, or it may be termed a preliminary course, a study is made of cotton fiber, including botanical classification of cottons. The cotton-producing districts of the world and their products are studied. Commercial grading and classification and the chemical and physical properties of cotton are also considered.

Ginning, mixing, the picker room, and carding are taken up in detail, practical instruction therein being given with marked thoroughness. In fly-frame practice proficiency is required in the use of a 32-spindle slubber with improved differential motion, a 42-spindle intermediate, 72 and 64-spindle fine roving frames, 96-spindle jack frame, roving reel, and scale and roving trucks.

It is required of a student in ring spinning that he be thoroughly up in all calculations pertaining to carding and spinning, the grinding and setting of the cards, and the manipulation of white and colored stocks. This knowledge only comes in time, to be sure, but it is demanded of a student that during his course he gain the necessary knowledge. Every student must produce a stated amount of warp, filling, and twist yarns. He must also be able to take apart, re-erect, repair, and care for 80-spindle, 64-spindle, and 160-spindle combined warp and filling frames, an 80-spindle filling frame, a 360-spindle 1½-inch gage spinning mule, and a dozen other of the most modern machines used for twisting, spooling, winding, and reeling. Lectures, recitations, demonstrations, and practice on all the most modern looms constitute the weaving curriculum.

A technical knowledge of dyeing is of marked importance to a textile manufacturer. It is, therefore, a fact of interest that in the thoroughly up-to-date technical school, the laboratory and dye house form a feature of note. The object of the course in dyeing is to give the student a clear idea of the fundamental principles which underlie the arts of bleaching and dyeing. This is done by experiment and research, assisted by lectures. Every student is required to properly bleach cotton cloth and yarn and to dye several kinds of textile materials. As a result, he gains expert knowledge concerning artificial coloring matters, compound shades, matching off, testing and valuation of dye stuffs, detection of dyes in the fiber, comparative tests, and the manufacture of dyes.

Besides understanding the different processes of cotton manufacture, a mill superintendent is called upon to manage the motive power, operation, and general economy of an entire plant. This knowledge is gained in the technical school by a thorough course in mechanical engineering, including investigation of the laws of statics, the underlying principles of the various general features of machinery, dynamics, strength of materials, the steam engine, power transmission, machine design, mill construction, ventilation, and sanitation. The department of physics in a technical school affords an excellent illustration of the thorough nature of the training. As a rule, physics are not attempted until the student's second year, when his work has fitted him for the solution of the problems that will present themselves. Every modern appliance, or more correctly the most important of these, are utilized in the course of instruction, the Olsen testing machine and the throttling calorimeter being notable examples. It is an interesting fact that in several technical schools the students have constructed some of the most important of the apparatus in use.

A broad foundation in general and theoretical chemistry is established, so that in future work new problems may be intelligently met and solved. Especial instruction is given in industrial chemistry. The knowledge he gains here will enable and has enabled the graduate student in business life to determine the relative value of the raw materials offered by dealers, and to conduct intelligently operations based on chemical principles, detect imperfections in them, and suggest improvements. He is prepared in this way to undertake analytical work of almost any description.

So the student gains a practical knowledge of quantitative analysis, consisting of general, applied, and analytical chemistry; inorganic chemistry, qualitative analysis, general methods, applied analytical chemistry; fuel, iron and steel, water, and fertilizer analyses; oil testing, organic chemistry, metallurgy, and physical chemistry.

It is plain that the commercial helpfulness of the graduate of a technical school is based on what he can do, rather than on what he knows. Throughout the various courses of a technical school of the first class not an instructor is permitted to either forget the urgency of this principle or to allow his pupils to lack appreciation thereof. So what is known as workshop practice must not be classed with manual school training, valuable as the latter undoubtedly is. The two bear much the same relation as the grammar school and the university.

In the workshop the entire force of knowledge of the student in mechanical engineering is called into play by his work in the machine shop, smithy, foundry, and woodshop. Throughout the first or apprentice year two days of eight hours each are devoted weekly to shop practice. About two-thirds of this time is spent in the woodworking shop. When sufficient skill has been attained to begin elementary pattern work, the student goes to the foundry, and is given elementary practice in molding. This enables him to understand the conditions imposed by the foundry upon the pattern maker. The remaining three years of a course are generally divided, as regards this class of work, between pattern making, foundry, smith shop, and machine shop. Here the student becomes expert in his understanding, in his practical knowledge, of the work that is always performed in establishments of this sort.

It is apparent that the mission of the technical schools of to-day consists largely of training the rising generation of those who are grouped under the title "captains of industry." They teach not only what the superintendent, the man of affairs in manufacturing work, must know in order to completely discharge his own duties, but they train him as well to look at the applied principle of work from the standpoint of the man at the loom, the forge, the dynamo.

THE LATEST IN CYCLES.

A novel bicycle has been built in London which has been pronounced "as comfortable as a rocking chair" and which shows remarkable mechanical ingenuity. This new machine is fitted with an anti-vibrating easy chair-like saddle which affords wonderful relief to a tired back and which proves a luxury when coasting down long hills. The ladies' machines are meeting with particular favor. They are of exactly the same construction as are the machines built for the men. The illustration gives some idea of the comfort found in these new bicycles.

Besides the chair-like saddle, the machine has another improvement. Note the position of the handle-bars. They are almost directly under the saddle. It is this arrangement that enables the woman to ride the diamond frame with ease. The steering gear is under perfect control and it will be seen that a smaller circle can be described on this machine than on any other.

The first machine of this make was built by P. W. Bartlett, of Richmond, England, for a Java resident. He was so pleased that he has now placed an order for twelve more of the same construction. The weight is somewhat greater than that of the light-weight racing machines, but as these bicycles are built for comfort and not alone for speed this is no detriment. The cost is the same as of any other high-grade bicycle.

THE REMORAS.

BY CHARLES FREDERICK HOLDER.

Any one who has spent any time in Southern waters, or engaged in shark fishing, is familiar with the remarkable fish, remora, shown in the accompanying photograph clinging to the glass by its singular sucker. Nearly all sharks have attendant remoras. I have found them on the swordfish, drum, black grouper, and even upon turtles in the Mexican gulf, and have also caught them when none of these fishes was in the vicinity. When a large shark is seen near the surface, on its dun-colored hide, or against it, will be seen a very distinct black streak parallel with the body about a foot long. Often several will be seen. If at such a time bait is thrown over, the black streak separates itself from its protector and appears as a long, slender, flat-headed fish, the remora, that in a sense is parasitic upon the shark.

So strong is the instinct of the remora to cling to the large fish that in most instances it will refuse to leave it when the latter is hauled out of the water, clinging with such energy that it can only be torn away by the display of much strength. I have seen them come ashore on the hammerhead at Santa Catalina, a huge specimen which I captured after several hours, and which only started inshore when four boats were made fast to it. I have also seen it on the sand shark and the white shark in the Mexican gulf, and doubtless other large fishes are used as a refuge by one or more species. The remora is easily "tamed." I have kept