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EDUCATIONAL WORK
OF THE COMMERCIAL MUSEUM
OF PHILADELPHIA

By

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PREFACE.

In industrial circles to-day the sciences and other subjects of a distinctly practical nature are looked upon as more important than dead languages and classics; and as a result, technical trade, manual training, and commercial schools and colleges have increased in number, and added emphasis has been laid in all schools on commerce and industries.

Methods of instruction have materially changed and objects and pictures are considered essential factors in many courses of study. Museums are an efficient aid in this method of teaching, but they have been utilized more especially in teaching arts and natural sciences, rather than in the study of geography, commerce, or industry. It was not until the establishment of the commercial museum that the latter subjects were illustrated in such a manner as to be useful for educational or commercial purposes.

EDUCATIONAL WORK OF THE COMMERCIAL MUSEUM OF PHILADELPHIA.

SCOPE OF THE INSTITUTION.

While visiting the World's Columbian Exposition in 1893, Dr. William P. Wilson, then in charge of the department of biology of the University of Pennsylvania, conceived the idea that the raw and manufactured materials from foreign countries on exhibition there might be preserved and used as the basis for a museum of commercial products to stimulate foreign trade. This resulted in the organization of the Philadelphia Commercial Museum on June 15, 1894.

It is a public institution, governed by a board of trustees of prominent business men whose purpose is, in the words of the late President McKinley, "to aid in the development of commercial and industrial prosperity." It is supported by appropriations from the city of Philadelphia for its general work, from the State of Pennsylvania for its special educational work, and by subscriptions from manufacturers and merchants in the United States for special service along commercial lines.

The work of the museum is carried on by two distinct departments—that of exhibits and that of the foreign trade bureau. The former has charge of the collection and exhibition of products illustrating the resources of our own and other countries and the educational work of the museum. The foreign trade bureau has for its object the development of the international commerce of the United States. It does this by encouraging individual manufacturers who are equipped for this business to seek new markets for their wares in foreign countries and by assisting them in inaugurating and developing this trade. The assistance given them is in the nature of practical information on every phase of export trade—its elementary features as well as its technicalities. The bureau also has a publication service, issuing regularly two journals. "Commercial America," issued in separate English and Spanish editions, circulates abroad with the purpose of inviting the attention of foreign merchants to the advantages of the United States as a country in which to purchase goods. The Weekly Export Bulletin, circulates only among manufacturers and exporters of this country, with the purpose of informing them of the wants of foreign importers and merchants, and posting them on all matters pertaining to export trade conditions, opportunities, and technicalities.

In addition to these departments, and primarily for their use but open to the public, there is a practical consulting commercial library, containing the trade statistics and other official documents of all countries; the consular reports of all countries which publish same; books on commerce, industry, production, distribution, and travel; directories, both trade and general, of all the commercial centers of the world; and a large number of trade journals, both domestic and foreign. This library is one of the most complete of its kind, of great assistance to the manufacturer and business man, the general reader and investigator, and invaluable to the staff of the institution.

The department of exhibits has charge of the museum. Its collections illustrate the important commercial products of the world and the present conditions of life and industry in all countries. They give opportunities for studying the life and customs of the people of foreign lands and illustrate the useful products of the vegetable, animal, and mineral kingdoms. The exhibits, therefore, are valuable to schools, because they illustrate geography, commerce, industries, and economics.

A very active and exceedingly important educational work is carried on under the department of exhibits, the main object of which is to teach the rising generation the important basic facts and principles which underlie modern industry.

The free educational activities referred to are briefly as follows:

Study of the exhibits, under the guidance of competent museum assistants.

Daily lectures to visiting classes, on subjects chosen by the teachers.

Special lectures to teachers and others.

Loan lectures, which consist of lantern slides and appropriate reading matter for the use of schools outside of Philadelphia. Lanterns and screens go with the lectures.

School collections or miniature museums, which are given free of cost to schools for classroom use.

All these parts of the work are described in the pages which follow.

THE EXHIBITS.

The main purpose of the exhibits is to portray the products and people of foreign lands.

A space of 30,000 square feet is occupied by comprehensive collections from South America, Central America, Mexico, and the West Indies. Each country of South America and each West Indian Island has its own section of the floor, where vegetable, mineral, and animal products are displayed. There are samples of commercial

grades of coffee and chocolate from Brazil, Venezuela, Colombia, Ecuador, Peru, Bolivia, Guatemala, Salvador, Honduras, Costa Rica, Nicaragua, Mexico, Hayti, Porto Rico, etc. There are samples of crude rubber, oil seeds, sugar, cabinet woods, resins, dyes, and great heaps of ores of silver, gold, copper, lead, tin, and other valuable metals. There are hundreds of samples of skins and fibers from all parts of Spanish America, wools and wheat from Argentina, nitrate from Chile, yerba maté from Brazil and Paraguay—an array of products of all kinds that makes on the visitor a very strong impression of the immense natural wealth of the New World.

The collections from China and Japan each occupy 7,500 square feet of floor space. They show the full range of natural products which enter so largely into commerce. Some of the leading industries of those countries, particularly silk and rice, are fully displayed, and the artistic work is represented by typical samples of fine porcelain, metal work, lacquer, and cloisonné. The exhibits illustrate also a great deal of the life of the Orient. In one place there is shown the life-sized figure of a Chinese scholar seated in his study; in another case a woman of the same nationality is engaged at the silk reel. Other cases show life-sized figures weaving matting or feeding mulberry leaves to silkworms. Then there are many models in miniature of the homes of the people, of machinery for silk manufacture, of ships, wagons, and other means of transportation.

India, Ceylon, Indo-China, and Siam cover more than 25,000 square feet of floor space, and the exhibits illustrate thoroughly the raw products of all that part of the globe. There are full series of coconut products, silk, jute, and fibers of many kinds, lac and other resins and gums, spices, teas, coffee, rubber, essential oils, teak wood, graphite, etc. These collections include also many cases devoted to native handiwork, such as wonderful silk fabrics, marvelous Indian muslins, embroideries, brass wares, lacquer work, and pottery. There is also a series of cases showing typical imports into those countries, which contains, among other things, muslins and other fabrics made in Europe, but of special designs, colors, and qualities suited to the native taste in the Far East.

The great Philippine exhibit covers 15,000 square feet of floor space and includes a full series of all grades of Manila hemp. Rice, sugar, pifia, tobacco, bamboo, rubber, tropical cabinet woods, ores, coal, and other natural products are shown in great variety. There are life-sized figures of civilized and savage people, clothing, tools, weapons, musical instruments, pottery, baskets, houses, and a variety of other exhibits which illustrate the people of the Philippines.

The collections from Australia and New Zealand illustrate the immense commercial importance of these regions. In addition to

the agricultural products which make such a wonderful show of grains; wools, etc., there is a great collection of timber, much of it from trees of the eucalyptus family. Then there are samples of many commercial grades of rabbit skins, the fur from which is used in the United States for the manufacture of felt hats.

The collection of articles from Tahiti, New Caledonia, Fiji, and other islands of the South Pacific is of unusual merit.

Few museums in the world possess such a large and varied collection of African materials. Separate sections are devoted to Egypt, Algeria, Tunis, Morocco, Somaliland, the French West African colonies (Senegal, Sudan, Guinea, Ivory Coast, Dahomey, and French Kongo), Liberia, Kongo, East Africa, and South Africa. These collections are rich in samples of rubber, palm oil, palm nuts, peanuts, Senegal gum, coffee, cotton, wools, and other raw products. Scores of cases are filled with a most interesting showing of articles which illustrate the life of the native people. Idols, musical instruments, mats, pottery, weapons, tools, and all sorts of native utensils show the conditions of life on the Dark Continent. Typical imported trade goods from Europe indicate the taste of the people and show American exporters what is saleable in a great market comprising millions of human beings who, at present, know little about American goods except coarse muslins. The cotton textiles, made by the natives themselves, are often interesting and attractive in design and excellent in quality. Accompanying a large series of these is a showing of goods made in England and in Germany in imitation of the native fabrics. This and other similar exhibits in the museum from these countries should teach our manufacturers how necessary it is to consider and cater to the tastes of their customers in export markets.

A separate series of exhibits covers such subjects as corn, wheat, sugar, tea, coffee, flax, silk, wool, gums and resins, rubber, animal skins and leather, coal, petroleum, asphalt, etc. These collections bring together the various types and commercial grades of the substance from all parts of the world, and show the utilization and manufacture of articles of all kinds. In the cotton exhibit there are samples from all parts of the cotton area of the United States, Egypt, India, China, Brazil, etc., long and short staple, rough and smooth varieties, a cotton gin in actual operation, and large samples of the various stages through which cotton passes in the machines which card, comb, and spin the fiber. This is supplemented by a large collection composed of specimens showing dozens of products of cotton seeds—the linters, cheap yarns and fabrics, batting, mattresses, quilts, celluloid, artificial silk, gun cotton, etc., oil cake, flour, meal and cattle feeds, oil, paint, soap, glycerin, cooking fats, etc. Only as these many things are brought together in one complete series does a stu-

dent get a full conception of the present-day value of cotton and its by-products to the business world.

The coal exhibit shows many examples of anthracite and bituminous coal, coke, lignite, and peat, but its most interesting features are two large models of coal mines—one showing a "breast," with a life-sized model of a miner at work, the other representing an entire coal mine in miniature, with the shaft, many tunnels, gangways, breasts, and different levels. To further amplify the coal exhibit there is a great series of specimens, arranged like a diagram, to show the varied products of coal tar—the aniline and other dyes, disinfectants, like carbolic acid and phenol; preservatives, like creosote and benzoate of soda; insecticides, like naphthaline; medicines, like aspirin; photographic developers, like metol and hydroquinone; perfumes, flavors, high explosives, paints, roofing material, fuel, and a host of other useful articles, all of them derived from a product of coal which not 50 years ago was classed as valueless.

These brief descriptions of the cotton and the coal exhibits give a mere hint of what is contained in the other monographic collections.

An important exhibit, at the main entrance, illustrates the history and development of commerce from the earliest beginnings to the present time.

EDUCATIONAL WORK FOR SCHOOLS.

ITS BEGINNING.

When the school-teachers of Philadelphia became aware that there were exhibits in the city such as have been described they naturally wished to bring their pupils to see the collections. It must of course be understood that the exhibits were gathered and shown, first of all, for the benefit of business men, but soon classes began to visit the exhibit halls. The teachers who accompanied them usually asked if one of the curator's assistants could go with the party to explain the collections. Soon both teachers and pupils were asking questions, for they felt that the men in this institution were experts, familiar with the products and commerce of the world, and able to speak with authority. Then there were teachers who, seeing in the museum large quantities of certain materials, asked for a small sample of something which they felt would be a help if they could take it to the classroom. Wherever the collection contained duplicate material which could be spared such requests were granted.

The work of the educational department has grown in a natural and spontaneous way from these small beginnings. It now covers the entire State of Pennsylvania. Its primary aim is to teach fundamental facts in regard to the commerce, industries, and products of the world.

LECTURES.

The work with visiting classes has, in the course of more than 10 years, grown into a very definite system. A series of lectures has been arranged in harmony with the course of study in geography prescribed by the Board of Public Education of Philadelphia. The lectures are on subjects that apply directly to the work in each school grade, from the fourth year upward. The titles of the lectures and the matter presented in each have been decided only after consultation with teachers in the city. Such information as, in the opinion of the teachers, can well be given in the classroom is not made a part of the lecture at the museum. The teachers say, however, that there are many things prescribed in the official course of study, such as the growth, preparation, and manufacture of important materials of commerce, that can best be explained at the museum, where specimens of the different substances may be seen and examined. The lectures therefore emphasize the industries and commerce of the world. No attempt has been made to introduce anything new into the curriculum. The sole effort has been to find out what the schools want and to give them that; to discover the needs of the teachers along the line of the present course of study.

A pamphlet addressed to the principals and teachers of the schools of the city of Philadelphia states that the Commercial Museum is prepared to receive classes and to deliver free lectures. The subjects and dates of the lectures are always chosen by the teachers, who select from a list of 80 titles offered by the museum. The lectures are illustrated by colored lantern slides and motion pictures, and lay especial emphasis on the industries and commercial products of the countries which are studied in the regular school work of the class. The lectures are always adapted to the comprehension of the pupils who attend, those to the lower grades being in very simple language. It is necessary for those who wish to take advantage of these opportunities to arrange with the curator of the museum for dates and to select subjects in advance.

The lectures now offered are as follows:

For university or college students, high schools, commercial schools, or eighth grades.—Wheat and flour, rice, sugar, fruit industry, tea, coffee, chocolate, spices, flax, cotton, wool, silk, fibers, carpets, hats, shoes, the lumber industry, paints and varnish, rubber, dyeing and tanning, meat industry, milk and cheese, fishing, iron and steel, tool making, mining, pottery, salt, building stones, fertilizers, coal and coal mining, petroleum, asphalt, the forms of carbon, by-products, Philadelphia industries, commercial transportation, commerce of the United States, commerce of South

America, important harbors of the world, ancient and modern trade routes, foreign business methods, the Panama Canal.

For seventh grades.—South Africa, Central Africa, North Africa, Philippines, Australia and New Zealand, South Sea Islands, Hawaii.

For sixth grades.—Italy, Switzerland, Spain, France, Germany, India, Japan, China.

For fifth grades.—Argentina, Brazil, the West Coast, coffee, rubber, South America, the West Indies, Cuba, Porto Rico, Barbados, Jamaica, Mexico, our island possessions, Philippines, Hawaiian Islands.

For fourth grades.—The United States, Pennsylvania industries, Philadelphia industries, the Southern States, the Western States, Niagara Falls, the Yellowstone, the Grand Canyon.

All the lectures are illustrated by a wealth of beautifully colored lantern slides and many educational motion pictures. The following brief descriptions will give a general idea of the ground covered in all the lectures:

The lecture on cotton describes and illustrates the cultivation and harvesting of cotton in the United States, India, Egypt, etc. It covers in full detail the cotton gins, presses, and transportation of raw cotton to the factories of the United States and Europe. Further illustrations, including motion pictures, make clear the work of spinning the fiber and weaving fabrics. The lecture touches on life in the South, the problem of Negro labor, and finally on the utilization of cotton seed and its many by-products.

The lecture on South America, given mostly to fifth-grade classes, is similarly illustrated by a series of colored lantern slides, showing cities like Caracas, Para, Manaus, Bahia, Rio, Buenos Aires, Santiago, Valparaiso, Lima, Quito, etc.; industries, such as mining for gold, silver, tin, and nitrate; the production of cocoa, sugar, wheat, cotton, tapioca, etc., and by motion pictures of the great industries of rubber, coffee, and cattle.

The lectures make a deep impression on the pupils, and are illustrated by colored lantern slides and motion pictures which transport the student to wheat fields, cattle ranches, coffee plantations, sugar fields, rice farms, rubber forests, lumber camps, flour mills, hat factories, and a thousand other places inaccessible to the ordinary pupil.

GUIDE WORK.

The lectures are always followed by an inspection and study of the exhibits which illustrate the country and industries referred to in the lecture. As classes leave the lecture room they are divided into groups of about 15 pupils. Each group is conducted by an experi-

enced and competent guide, employed by the museum, and under careful direction the children are shown the specimens which illustrate the lecture. Further instruction is given, and the students are encouraged to ask questions about what they may not have understood.

This part of the work is of great importance, for by question and answer the guides soon learn what the pupils know and help them to a clear understanding of important points. Then, too, there are often facts which can be appreciated best when one sees the real products, and neither pictures nor words of a lecturer can lessen the value of close contact with specimens. Sometimes the guides open showcases and allow certain objects to be passed around. The average child looks with great respect on the articles shown so carefully in the glass cases of a museum and receives a deep and lasting impression when permitted to touch such specimens, many of which come from distant lands.

During an hour in the lecture room and another hour spent in the study of the museum's collections, the teachers say that the class learns more than the pupils usually get from many hours in a classroom. The strength of this work lies in the combination of a lecture with the study of the concrete objects which are needed to make real the words uttered by a teacher or written in a book. The large and varied exhibits shown in the Commercial Museum make an impression not easily forgotten.

The information so imparted is up-to-date, authentic, and reliable. The work lays a foundation for just what the pupil needs to stimulate an intelligent interest later, in the development of trade, and to increase a knowledge of raw materials and of the processes of production and manufacture.

The advantages offered by the museum are appreciated by teachers and pupils to such an extent that the attendance at the lectures has doubled each season for several years past, and continues to increase. Requests from principals and teachers have been so numerous that the curator has been forced to refuse many applications. The seating capacity of the lecture room is often insufficient for the classes wishing to attend the lectures, and there is scarcely a school day when the museum has a sufficient number of assistants to guide all the pupils through the exhibits after the lecture.

In a recent calendar year there was a total attendance of 40,000 pupils at these lectures, representing classes from schools of all grades. More came from high schools, colleges, and the University of Pennsylvania than in any previous year. Scholars of all ages frequently come with their teachers from schools 10 miles away, and their special trolley cars wait on a siding near the museum till the visit is over. Public and private schools are received with an equal welcome and the parochial and Friends' schools are frequent visitors.

In order to reach a greater number of pupils than can be accommodated in the lecture room on five school days each week, free motion-picture lectures on commerce and geography have often been given on Saturday mornings at 10.30 o'clock.

SATURDAY LECTURES TO THE PUBLIC.

Free illustrated lectures to the general public are given on Saturday afternoons at 3 o'clock from the 1st of October to the last of April. These lectures are almost exclusively on geographic subjects and have for years attracted crowds which fill the lecture hall to overflowing. Many of the lectures are given by members of the museum staff and some by well-known travelers.

SLIDES AND MOTION PICTURES.

For many years the Commercial Museum has been gathering together a series of thousands of photographs and colored lantern slides, to illustrate all phases of industry, not only at home but in the most distant and remote parts of the globe.

Many lessons are best taught by the use of motion pictures, and the museum is fortunate in owning an invaluable collection of films. They are of especial value as a means of explaining industrial processes; in fact there is no other practical way of showing such things to tens of thousands of children. The actual farms, plantations, ranches, and mines are too far away to be visited. Even at home our manufacturing establishments can not allow their work to be interrupted by unending crowds of children and older students who really ought to see how the world's work is done. The motion-picture film has solved the problem and makes it possible to explain many things in a lecture room by means of pictures in a more satisfactory and intelligible way than can be done to a large class amid the noise and bustle of a great modern factory.

But it is not enough to show motion pictures; if we are to teach in the truest sense, we must do more than present facts. We must select, eliminate, classify, and arrange the facts to properly present the lesson. So, if motion pictures are to have true educational value, they must be edited by some one in close touch with the work of the school and must be presented at the right time and in the right way. The problem of doing this has been solved very satisfactorily by the Commercial Museum. The best films to illustrate commercial and industrial subjects have been obtained, some by donation and some by purchase. Excellent pictures have also been taken with the museum's motion-picture camera. The series is being constantly added to and there is probably nowhere else in America such a stock of good motion-picture films of industrial processes suitable for illustrating educational lectures.

SCHOOL COLLECTIONS.

The lecture system just described makes of the museum and its exhibits a great laboratory for the study of geography, commerce, and the world's industries. Teachers of these subjects even in the elementary schools need the help of laboratory work, and it is not sufficient for a class to visit the museum only occasionally. Illustrative material is needed in the classroom. Certain specimens should always be in the hands of the teachers.

As has already been stated, the museum began years ago to give to teachers samples of duplicate material from its store rooms. The distribution of a comparatively small amount of such material stimulated many other schools to ask for similar gifts. Increased demands soon compelled the museum to systematize the work and made it necessary to prepare a number of collections each containing some of the most important commercial raw materials.

In order to be sure that the collections shall contain the most helpful specimens and that everything shall be convenient for the use of the schools, there have been many consultations between able teachers in the State and the museum's staff.

About the year 1900 there were prepared and presented free of cost to schools in Pennsylvania 250 collections. Each set contained several hundred specimens of important commercial products, and from 100 to 200 photographs. These collections were distributed not as a loan, but as a gift; so that the specimens were always available. The collections proved to be of great service, furnishing object lessons of much value in the study of geography and commerce.

From the very first these collections have been systematically arranged, and they contain the chief raw materials which make up the bulk of the world's trade and commerce, thus illustrating the principal industries in all parts of the world.

The specimens in the collection are supplemented by photographs which illustrate the growth, preparation, and manufacture of all the substances.

Every photograph is mounted on a heavy card, on the back of which several paragraphs are printed giving the information needed by teachers and pupils to make clear just what the photographs should teach. The pictures have been carefully chosen, the information is appropriate for the needs of the schools, and the language is such as is easily understood even by young pupils. One finds, for example, on the back of the picture of a cotton gin, an explanation of the construction and operation of the machine. This explanation is in simple language, free from every suggestion of technicality, but is wholly accurate. After it was written a manufacturer of cotton gins read it over carefully, and not till he approved it was this material printed.

As first arranged, many specimens were placed in glass bottles, the fibers were tied in hanks, the minerals placed on labeled blocks of wood, and a school receiving a collection was required to provide showcases of considerable size for the display and preservation of the exhibit.

Four different collections (known as No. 1, No. 2, No. 3, No. 4) were offered, suitable in size and scope to the needs of graded schools, from the primary to the high school. Miniature museums of this type were sent out by the hundred and reached schools in every county of the State. Some schools prefer a museum of this kind and a limited number are still distributed.

To meet the requirements of the ungraded country school which is often unable to supply the large show case needed, but which is in great need of this assistance to practical teaching, a different type of collection was devised and offered for distribution. This collection of specimens is contained in an upright ash cabinet which stands on the floor of the classroom, occupying so little space that if desired it can be placed alongside the teacher's desk.

The specimens are securely fastened in drawers, each containing one series and covered with glass. These drawers are small enough (10 inches by 15 inches) to be handled easily by children.

The smallest collection of this type contains nine drawers illustrating corn, rice, coffee, beverages, coconut, flax, cotton, sheep, silk, and carbon products. They fit in a cabinet 42 inches high, with many photographs covering these subjects in a closet in the lower part of the cabinet.

The convenience of this type of collection in which the entire series of one article of commerce, such as cotton or coal, may be passed around the classroom without fear of damage or disarrangement became so evident that it was decided to expand the collection in similar form. The larger collection of the material is arranged in two upright cabinets, the first being identical with the one used in the lower grades, the second containing 15 additional drawers. It includes substantially the same material as that contained in the No. 4 collection, making it suitable for high-school instruction without requiring so much space in the classroom, and avoiding the expense to the school of providing show cases.

The two cabinets hold several hundred specimens of the most important materials which make up the bulk of the world's commerce. The full series includes foods, beverages, spices, fibers, woods, tans, dyes, oils, gums, resins, and other vegetable and animal products; the chief ores, building stones, and economic minerals. The specimens are all arranged in series to show the origin of a substance and the important stages through which it passes toward a finished product.

The following is a complete list of the specimens and photographs in one collection:

The Corn Tray.

Section of ear of corn.
Mixed corn.
Pop corn.
Popped corn.
Hominy.
Corn flakes.
Corn meal.
Cornstarch.
Dextrine.
Grape sugar (glucose).
Corn sirup.
Corn oil.
Rubber substitute.
Corn oilcake.
Corn plth.
Photograph.
Making tortillas, Mexico.
Map.
Geographic distribution of Indian corn.

The Rice Tray.

Rice plant.
Rough rice.
Hulled rice.
Cleaned rice.
Flaked rice.
Puffed rice.
Rice starch (rice flour).
Rice cakes.
Amé.
Rice straw rope.
Photographs.
Harvesting rice, Louisiana.
Transplanting rice, Japan.
Cutting rice, Japan.
Separating rice from the straw, Japan.
Cleaning rice, Japan.
Paddy fields, Ceylon.
Going to market, Japan.
Water carrier wearing rice straw coat, Japan.
Map.
Geographic distribution of rice.

The Beverages Tray.

Tea leaf.
Japanese green tea.
Formosa oolong tea.

The Beverages Tray—Continued.

Chinese black tea.
Brick tea.
Photographs.
Tea leaves, flowers, and fruits.
Picking tea, Japan.
Preparing tea, pan-firing, Japan.
Tea factory, Ceylon.
Tea ships, Formosa.
Map.
Geographic distribution of tea.
Coffee berries.
Parchment coffee.
Cleaned coffee.
Peaberry coffee.
Chicory.
Photographs.
Coffee tree, Costa Rica.
Picking coffee, Brazil.
Drying coffee, Costa Rica.
Coffee-drying machinery, Costa Rica.
Sorting coffee, Costa Rica.
Map.
Geographic distribution of coffee.
Cacao beans.
Bitter chocolate.
Cacao butter.
Cocoa.
Photographs.
Cacao tree in fruit, Trinidad.
Opening cacao fruits, Jamaica.
Drying cacao, Trinidad.
Chocolate factory, United States.
Map.
Geographic distribution of cacao.

The Coconut Tray.

Coconut in husk.
Palm wood.
Coconut fiber, "coir" straight.
Coconut fiber, "coir" tangled.
"Coir" yarn.
Cocoa matting.

The Coconut Tray—Continued.

Part of scrubbing brush made
from coconut husk.
Shredded coconut.
Copra.
Coconut oil.
Coconut oil cake.
Coconut shell charcoal.

Photographs.

Coconut plantation, Ceylon.

Opening coconuts, Philippine Islands.

Making coconut oil, Ceylon.

Map.

Geographic distribution of coconut trees.

The Cotton Tray.

Cotton plant.
Unginned cotton.
Ginned upland cotton.
Ginned Sea Island cotton.
Peruvian cotton.
Cotton roving.
Cotton yarn.
Sewing thread.
Unbleached muslin.
Bleached muslin.
Calico.
Gingham.
Mercerized gingham.
Cotton rope.
Celluloid.
Cotton seeds.
Cotton linters.
Cottonseed oil.
Cottonseed oil foots soap.
Cottonseed oil cake.

Photographs.

Picking cotton, Arkansas.

Cotton gins, Arkansas.

Baling cotton, Arkansas.

Cotton market, Montgomery, Ala.

Cotton factory, Arequipa, Peru.

Map.

Geographic distribution of cotton.

The Flax Tray.

Flax plant.
Flax fiber.
Tow.

The Flax Tray—Continued.

Natural linen.
Bleached linen.
Linen crash ("huck").
Linen twine.
Linen paper.
Flaxseeds.
Raw linseed oil.
Bolted linseed oil.
Linoleum.

Photograph.

Harvesting flax, Washington.

Map.

Geographic distribution of flax.

The Silk Tray.

Silkworm eggs.
Young silkworm.
Mature silkworm.
Mulberry leaves.
Cocoon cut open to show pupa.
Pierced cocoon.
Moth.
Cocoons.
Raw silk.
Tussah silk thread.
Silk.
Satin.
Velvet.
Bolting cloth.
Pongee.
Silk waste.
Spun silk.
Artificial silk.
"Fiber" braid.

Photographs.

Feeding silkworms, Japan.

Cocoon merchant, Japan.

Reeling silk, Japan.

Steam silk reeling, Shanghai, China.

Weaving silk, Japan.

Map.

Geographic distribution of silk.

The Sheep Tray.

Sheepskin with wool.
Merino wool.
Lincoln wool.
Native wool.
Combed wool.
Woolen yarn.
Worsted yarn.

The Sheep Tray—Continued.

Carbonized nolls.
Shoddy.
Woolen cloth.
Worsted cloth.
Flannel (all wool).
Flannel (part cotton).
Felt.
Lanoline.
Leather.
Chamois.
Catgut.

Photographs.

*A flock of sheep, N. S. W.,
Australia.*
*Shearing sheep, N. S. W.,
Australia.*
*Llamas, a pack train, San
Mateo, Peru.*

Map.

*Geographic distribution of
sheep, etc.*

The Carbon Tray.

Peat.
Lignite.
Bituminous coal.
Photographs.
*Mining bituminous coal,
Pennsylvania.*
*Entrance to a coal mine,
Fairmont, W. Va.*
*Miner's village and coke
ovens, Fairmont, W. Va.*

Coke.

Cannel coal.

Anthracite.

Photograph.

*Coal breaker, Shenan-
doah, Pa.*

Map.

*Geographic distribution
of coal.*

Coal tar.

Aniline dyes.

Naphthaline.

Crude creosote.

Petroleum.

Illuminating oil.

Petrolatum.

Lubricating oil.

Paraffine wax.

Photograph.

*Oil wells, Los Angeles,
Calif.*

The Carbon Tray—Continued.

Map.

*Geographic distribution of
petroleum.*

Charcoal.

Graphite.

Photographs.

Graphite mine, Ceylon.
*Diamond mines, Kimber-
ley, South Africa.*

Asphalt.

Photograph.

Asphalt lake, Trinidad.

Woods.

White oak (quartered).

Map.

*Geographic distribution of
oak, etc.*

allornia redwood.

Cigar-box cedar.

Ebony.

Map.

*Geographic distribution of
ebony, etc.*

Teak.

Map.

*Geographic distribution of
teak, etc.*

Mahogany.

Map.

*Geographic distribution of
mahogany, etc.*

Logwood.

Cork.

Map.

*Geographic distribution of
cork, etc.*

Photographs.

*Hauling logs, Vancouver,
British Columbia.*
Sawmill, Australia.
Big trees, California.
Timber flume, Hungary.

Additional photographs.

Cutting bananas, Jamaica.
*Banana carriers under a
breadfruit tree, Ja-
maica.*
Pineapple field, Jamaica.
*Paploca factory, Singa-
pore.*
Cutting tobacco, Mexico.
*Indian fur traders, Great
Slave Lake, Canada.*

Woods—Continued.**Additional photographs—Con.***Drying cod, Provincetown, Mass.**Junkieha and carrying chairs, Hong Kong, China.***Woods—Continued.****Additional photographs—Con.***Freight and passenger barrow, China.**A country road, Ceylon.*

Another collection contains all of the material on the preceding list, with 15 additional drawers, as follows:

The Wheat Tray.

Heads of wheat, bearded and beardless.

• Soft wheat.

Hard wheat.

Photographs.*Harvesting wheat, Washington.**Wheat in bags awaiting shipment, Geogery, New South Wales, Australia.**Grain elevator, Deloraine, Manitoba.***Map.***Geographic distribution of wheat.*

First break.

Second break.

Unpurified middlings.

Purified middlings.

Bran.

Graham flour.

Whole-wheat flour.

White flour (patent flour).

Photograph.*Packing flour, Minneapolis, Minn.*

Durum wheat.

Flaked wheat.

Shredded wheat.

Macaroni.

Straw braid.

The Grain Tray.

Barley in the head.

Barley.

Pearl barley.

Rye in the head.

Rye.

Oats in the head.

Oats.

Oatmeal.

Rolled oats.

The Grain Tray—Continued.

Foxtall millet in head.

Foxtall millet.

Barnyard millet.

The Sugar Tray.

Piece of sugar cane.

Photograph.

Cutting sugar cane, Hawaii.

Raw cane sugar (Muscovados).

Raw cane sugar (vacuum process).

Photographs.

*Pressing sugar cane, Java.**Sugar factory, Java.*

Raw beet sugar.

Molasses.

Refined sugar.

Rock candy.

Maple sugar.

Maple sirup.

Industrial alcohol.

Palm sirup.

Sugar of milk.

Glucose.

Saccharine.

Map.*Geographic distribution of cane and beet sugar.***The Spice Tray.**

Black pepper.

White pepper.

Photograph.

Picking pepper, Singapore.

Ground pepper.

Red peppers (Chilies).

Cayenne pepper.

Allspice (Pimento).

Photograph.

Drying allspice, Jamaica.

Cloves.

Nutmeg.

Mace.

Yellow mustard.

The Spice Tray—Continued.

Cinnamon.

Photograph.

Cutting cinnamon, Ceylon.

Cassia bark.

Vanilla beans.

Photograph.

*Vanilla vines, German
East Africa.*

Vanillon.

Caraway.

Turmeric powder.

Coated ginger.

Peeled ginger.

The Gums and Resins Tray.

Gum arabic.

Gum tragacanth.

Seaweed gelatine ("Agar-Agar").

Catechu ("Cutch").

White turpentine.

Pine rosin.

Manilla copal.

Kauri copal.

Zanzibar copal.

Gum dammar.

Olibanum.

Myrrh.

Gamboge.

Tolu balsam.

Aloes.

Asafoetida.

Photograph.

*Cutting up camphor log,
Formosa.**The Rubber Tray.*

Pará rubber ("Upriver fine").

Photographs.

*Tapping a rubber tree,
Amazon Valley, Brazil.**Smoking rubber, Amazon
Valley, Brazil.*

Ceará rubber ("Scrap").

Photograph.

Ceará rubber tree, Ceylon.

Plantation rubber ("Ceylon biscuit").

Plantation rubber ("Ceylon crepe").

Mexican rubber ("Sheet").

Photographs.

*Central American rubber
tree, Trinidad.**Tapping a rubber tree,
Chiapas, Mexico.**The Rubber Tray—Continued.*

African ball rubber.

Map.

*Geographic distribution of
rubber.*

Guayule.

Vulcanized rubber.

Rubber tubing.

Rubber sponge.

Rubber cloth.

Rubber bruid.

Elastic rubber band.

Rubber eraser.

Hard rubber (Vulcanite).

Rubber toy.

Rubber substitute made of rapeseed
oil.

Gutta percha.

Gutta guttation.

Gutta-percha (Red Macassar).

Gutta-jelutong ("Pontianak").

Balata.

*The Paper and Paper-making Materials
Tray.*

Papyrus stem.

"Rice paper."

Parchment paper.

Paper mulberry bark.

Paper, mulberry paper.

Linen rags.

Linen pulp.

Linen paper.

Wood chips.

Wood pulp.

Wood-pulp paper.

Straw.

Straw board.

Jute butts.

Jute paper.

Esparto grass.

Esparto paper.

Blotting paper.

Waxed paper.

Cover paper.

Woven paper, wall covering.

Bristol board.

Paper board.

Papier-maché.

The Rope Fiber Tray.

Sisal hemp fiber.

Photographs.

*Sisal hemp plant, Bahama
Islands.**Pulque gatherer, Mexico.*

The Rope Fiber Tray—Continued.

Map.

Geographic distribution of sisal hemp.

Manilla hemp.

Photograph.

Cleaning Manilla hemp.

Manilla rope.

Photograph.

Rope factory, Hong Kong, China.

Piece of hemp stalk showing fiber.

American hemp fiber.

Photograph.

Harvesting hemp, Hungary.

Jute fiber.

The Brush Fiber Tray.

Split bamboo.

Photograph.

Bamboo, Jamaica.

Peeled rattan.

Photograph.

Sorting rattan, Singapore.

Plassaba.

Kittool.

Coir (Coconut fiber).

Broom root (Rice root).

"Sea grass."

Steel wire.

Hog bristles.

Bristle brush.

Scrub brush.

Camel-hair brush.

Photograph.

Camels carrying charcoal, Constantinople, Turkey.

Horse hair.

Broom corn.

The Insect Products Tray.

Honey bees.

Honey comb (worker comb).

Honey comb (drone comb).

Beeswax.

Extracted honey.

Chinese blistering beetles.

Stick lac.

Seed lac.

Shellac.

Bleached shellac.

Sealing wax.

Aleppo oak galls.

Ground galls.

Scarlet cloth.

Cochineal insects.

The Cow Tray.

Cow hide.

Map.

Commercial sources of cattle hides.

Oak sole leather.

Photograph.

Tan yard, Chile.

Rough split leather.

Black finished leather.

"Kangaroo grain" leather.

Chrome calf.

Patent calf.

Cow hair.

Dried beef.

Photographs.

*Stock yard, Chicago, Ill.**Beef in cold storage, Sydney, New South Wales.**Australia.**Branding cattle, Alberta.**Canada.*

Dried milk.

Sugar of milk.

Casein.

Beef tallow.

Neat-foot oil.

Glycerine.

Bone.

Bone buttons.

Ground bone.

Bone black (animal charcoal).

Horn comb.

Animal gelatine.

Glue.

The Iron Tray.

Red hematite.

Specular iron ore.

Limonite.

Mammillary limonite.

Magnetite.

Map.

Distribution of iron ores.

Pyrite.

Pyrite crystals.

Pig iron.

Photographs.

*Iron furnace, Hankow,**China.**Blast furnace and mold-**ing floor, Kentucky.*

Cast iron.

Wrought iron.

Tool steel.

The Iron Tray—Continued.

Rough steel-casting.
 Steel in various forms.
 Galvanized sheet iron.
 Galvanized iron wire.
 Tin plate.
 Tinned wire.
 Yellow ochre.
 Sienna.
 Venetian red.
 Prussian blue.
 Copperas.

The Ores and Metals Tray.

Copper ore (Chalcopyrite).
 Copper ore (Malachite).
 Copper.
 Brass.
 Bronze.
 Blue vitriol.
 Zinc ore (Sphalerite).
 Zinc.
 Galvanized iron.
 Lead ore (Galena).
 Lead pipe.
 Type.
 White lead.
 Tin ore (Cassiterite).
 Tin ore (Stream tin).
 Tin foil.
 Tin plate.
 Mercury.
 Vermillion.
 Gold ore.
 Gold sand.

Photographs.

*Washing gold, Vancouver,
 British Columbia.
 Hydraulic mining, Otago,
 New Zealand.*

Map.

*Geographic distribution of
 gold ores.*

Silver ore.**Photographs.**

*Mining, Sierra mine,
 Guanajuato, Mexico.
 Smelter, Aguascalientes,
 Mexico.*

Map.

*Geographic distribution of
 silver ores.*

Cryolite.**The Ores and Metals Tray—Continued.**

Aluminium ore (Bauxite).
 Aluminium.

The Useful Minerals Tray.

Emery.	} Abrasives.
Emery cloth.	
Garnet.	
Pumice.	
Sandpaper.	
Carborundum.	}
Rouge.	
Feldspar.	} Pottery and glass.
Kaolin.	
Flint.	
Rock flint.	

Photograph.

*Blowing glass, Philadel-
 phia, Pa.*

Asbestos.	} Fireproofing.
Mineral wool.	
Soapstone (talc).	
Mica.	} Fertilizers.
Phosphate rock.	
Potash salts.	
Nitrate of soda.	
Rock salt.	

Photograph.

*Salt evaporation, Cali-
 fornia.*

Borax.
 Sulphur.

The Building Stones Tray.

Gray granite.
 Red granite.
 Limestone.
 Fossiliferous limestone.
 Quicklime.
 Tennessee marble.
 Photograph.

Marble quarry, Vermont.

Mexican onyx.
 Hydraulic limestone.
 Portland cement.
 Gypsum.
 Plaster of paris.
 Fire clay.
 Fire brick.
 Gray sandstone.
 Red sandstone.
 Slate.
 Trap.

The State Legislature of Pennsylvania, recognizing the value of such illustrative material, appropriated in 1905 the sum of \$25,000 for this work, and has continued to support it by grants of money at each session since that time.

The collections are sent from Philadelphia without cost to the schools, and when received become the property of the schools. It is sometimes suggested that the collections might be loaned; not given, and so passed from one school to another. This would involve much expense in repeated shipments, and from the standpoint of the teacher is open to the objection that the specimens would often not be on hand when most needed. It would mean that the school curriculum would have to be adjusted to the time when specimens would be available to illustrate certain lessons. It is certainly better to have the specimens always on hand to illustrate the lessons of the day, accessible when needed.

Several thousand of these miniature museums are now in active use in schools in Pennsylvania.

The collections are always accompanied by a book on "Commercial Raw Materials, Their Origin, Preparation, and Uses," written by the curator of the museum. This book was prepared primarily to give to teachers such information on the specimens in the school collections as might be useful and appropriate for classroom purposes. The book states in the briefest way what teachers and pupils need to know about the chief raw materials of commerce. Its value is in that it selects from a great mass of general information to be found in exhaustive works on technical subjects and gives such facts as are properly a part of instruction in secondary and high schools.

This publication was first issued by the museum for free distribution with the school collections. The original edition was a small one, and many outside requests were made for copies of the book. It became necessary to give it wider circulation, and the plates were therefore turned over to a large publishing house which has issued it for general sale. It is now used in many schools in all parts of the United States and seems to fill a need not covered by any other book in print.

Domestic science courses are increasing rapidly in the schools of this Commonwealth. A new collection in a similar cabinet has been especially designed to help in the teaching of textiles.

LOAN LECTURES.

Any public-school teacher in Pennsylvania is privileged to borrow at any time, without charge, a set of colored lantern slides, accompanied by a typewritten lecture, lantern, and screen. These illustrated lectures cover such subjects as Panama and the canal, Porto

Rico, Jamaica, Argentina, Philippines, Hawaii, South Sea Islands, Japan, China, Kongo, Egypt, Niagara, cotton, iron and steel, lumbering, forestry, Philadelphia, etc. The slides which illustrate these lectures have been selected with the greatest care, and the typewritten sheets have in them exactly what would be said to a class in the lecture room in Philadelphia. Much of this is information not readily accessible to a teacher, particularly one in a rural district who has not had opportunity to make a careful and detailed study of the subject.

The lectures emphasize especially the industries of the countries described—the one on Mexico, for instance, takes up the silver, gold, lead, and copper mines, the plantations of coffee, sugar, cotton, rubber, tobacco, vanilla, sisal fiber, etc. It describes also the conditions of life among the peons, the local industries, such as drawn work and pottery, and illustrates the handsome modern streets of Mexico City. The lecture touches in only the briefest possible way on war in Mexico, since the aim is to describe the country, its people, and industries in a time of normal peace.

The lecture on iron and steel begins with an illustration and description of the different kinds of iron ore. Then there are views of iron mines in Alabama, showing the production of both low-grade and high-grade ores. The views include pictures at the entrance to the mines, in the tunnels, and in the actual workings where the hard red ore is blasted out. This series of 12 pictures is supplemented by one of a model town for the negro laborers. Then come colored slides of underground mining for magnetic ore in Essex County, N. Y., and of the great hematite mines in Minnesota.

Five more slides show the ore being loaded on lake steamers and unloaded by wonderful mechanical methods. Next come views of Cuban mines, of ore from India unloading at Philadelphia, and of the ore docks in Norway.

Ten slides follow which illustrate the construction of a blast furnace and making of pig iron in this and other countries. Then come five pictures showing the conversion of iron into Bessemer steel and the making of great ingots. Seven slides show progressive stages in rolling and handling steel rails. Three slides illustrate the manufacture of open-hearth steel. Twelve slides cover thoroughly the making of tin plate by forging, shearing, rolling, doubling, pickling, annealing, cold rolling, and tinning. The remainder of the pictures cover the manufacture of wire, nails, bolts, rivets, pipes, tubes, locomotives, boilers, and, finally, a great warship of the American Navy.

Any school which owns a lantern needs only to borrow a set of slides and the accompanying lecture. A school which has no lantern may, without charge, borrow one from the museum. It will be supplied at the option of the teacher with a lamp to use electric cur-

rent, acetylene gas, or high-grade kerosene oil. The former, of course, gives the most brilliant picture. A screen on which to show the slides goes with the lantern. The outfits loaned in this way are so simple in construction and operation that they are used constantly by persons who never saw a lantern slide nor touched a stereopticon until they received the shipment from Philadelphia. The only cost to the schools for all this service is the matter of express charges from Philadelphia and return.

The work of loaning slides has grown rapidly during the past few years. Nearly one hundred thousand pupils in the State shared last season in the educational advantages given by this system of loan lectures.

The value of this work lies not merely in the information imparted. The lectures are often given in the evenings, especially in the rural districts, and at such times parents as well as children gather at the schoolhouses. This is a distinct aid to the movement which aims to make the rural school a social center for each neighborhood and a factor in the upbuilding of community life. Then, too, the illustrated lecture makes on the pupils a deeper and more lasting impression than the words of a book, and the teacher often finds that after a lecture illustrated by colored lantern slides there is little difficulty in persuading the pupils to give "oral expression" to what is in their minds. Some teachers have great success in giving the lectures through the voice and words of one of the older pupils, who by this means gets valuable training in memory, expression, public speaking, and other things of value in after life.

Very often when an outfit of lantern, screen, and slides is sent to a rural school a schedule is prepared for future shipments. Then the lantern is allowed to remain in one neighborhood for several months, while fresh sets of slides are sent from the museum every week. An ideal arrangement is made by many teachers who transfer the entire outfit to a near-by school as soon as they have used it. In this way several schools may form a circuit sharing the cost of expressage so that no school is subject to any considerable expense.¹

The work of loaning these sets of colored lantern slides has grown with marvelous rapidity and shows signs of ever-increasing popularity.

During the past winter the demand was so active that the stock of slides and supply of lanterns was inadequate. Many new lanterns

¹ The following actual schedule is an example of this: On Dec. 21 a set of slides on Porto Rico, with typewritten lecture, lantern, kerosene oil lamp, and screen were shipped to a teacher in Mahoning Township, Carbon County, Pa. The outfit was used at Horn's School, Dec. 23; Sendel's School, Dec. 26; Oak Grove School, Dec. 27; Pleasant Corner School, Dec. 30; Upper Beaver Run School, Dec. 31; Strass Valley School, Jan. 2. It was received at the museum on the morning of Jan. 4 in good condition and promptly sent to another applicant.

were purchased to take care of dozens of schools that had no apparatus of their own, and many duplicate sets of slides were colored and put in circulation. With such popular subjects as Panama, Mexico, and Argentina it is necessary to have half a dozen sets or more of each. Often it is not possible to send these lectures at just the time requested.

Some applicants have stereopticons of their own, but many borrow lanterns from the museum. Often the lecture goes to small country schools where no facilities of the kind were ever used before.

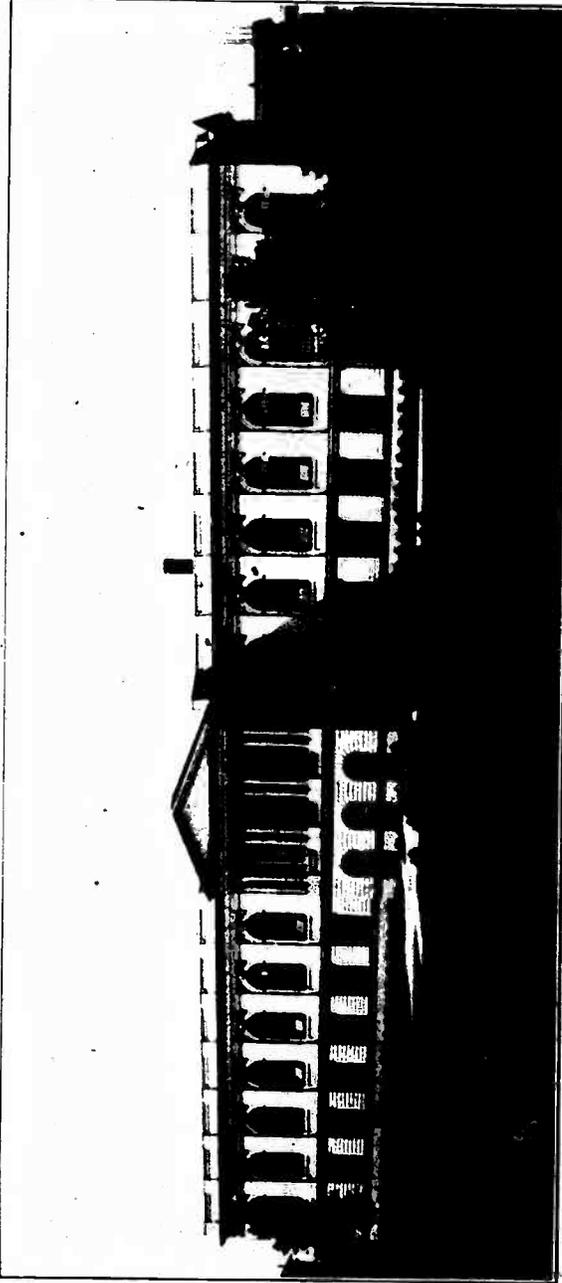
Motion-picture films are loaned free of cost to any schools which have facilities for using them. Few schools in Pennsylvania are as yet able to avail themselves of this service, for motion-picture projecting machines have not been installed in many places. It is believed by many well-informed persons, however, that the use of the "movies" will increase rapidly in educational work within a few years, and many schools are now interested to know that they can borrow many pictures at any time without cost.

The Philadelphia Commercial Museum will loan to a Pennsylvania school films, illustrating wheat harvesting, flour milling, barley harvesting, rice culture, sugar cane, dairying, tea picking, coffee culture, cheese making, tapioca manufacture, coconut industry, apple orchard, grapes and raisins, prunes, pineapples, cranberries, peanuts, wine, tobacco, cotton, lace curtains, straw hats, paper making, hemp growing, rope making, silk growth and manufacture, ostrich industry, lumbering, rubber industry, turpentine, cattle, shoemaking, hat making, sheep and wool, sponges, oyster fishing, coal, salt, diamonds, asphalt, petroleum, pottery, iron and steel, and dozens of other subjects. The pictures have been taken in all parts of the United States and in Mexico, Brazil, Argentina, England, France, Switzerland, Holland, Italy, Germany, Tunis, Congo, South Africa, India, Straits Settlements, Burma, China, Japan, Philippines, Australia, and New Zealand.

○

BUREAU OF EDUCATION.

BULLETIN, 1930, No. 13 PLATE I.



PHILADELPHIA COMMERCIAL MUSEUM—NORTH BUILDING.

This is one of three permanent exhibition buildings having steel framework and walls of brick and cement. Each building is about 400 feet by 100 feet. The facing seen here is of white terra-cotta. There are also a large power house and workshops, a convention hall covering 2 acres, and 17 acres of ground.

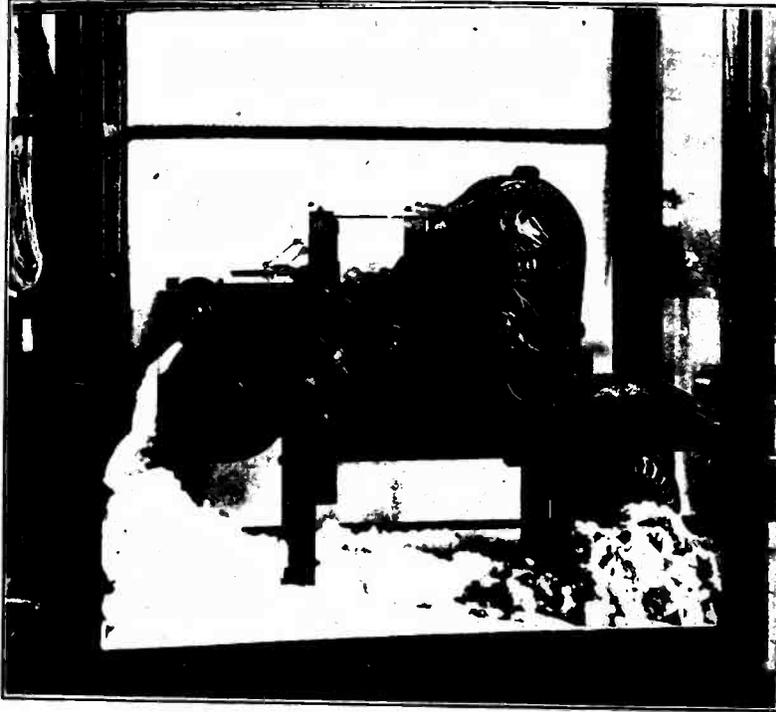


A. GATHERING TURPENTINE, GEORGIA.



B. PICKING COTTON IN GEORGIA.

This model of a southern mammy is true to life. It arrests the attention of children and grown people who are thus tempted to tarry and learn more of what the adjacent Cotton Exhibit teaches.



A. A COTTON GIN.

Not a miniature model, but an actual gin—the smallest one which is regularly made and sold. Run by an electric motor, this machine separates the seeds from the cotton while visitors look on.



B. OIL WELLS IN WESTERN PENNSYLVANIA.



A. THE HISTORY OF COMMERCE.

The large steamship is the "Mauretania" scale 1 inch to 1 foot; the first Cunarder; model of Fulton's boat, etc.

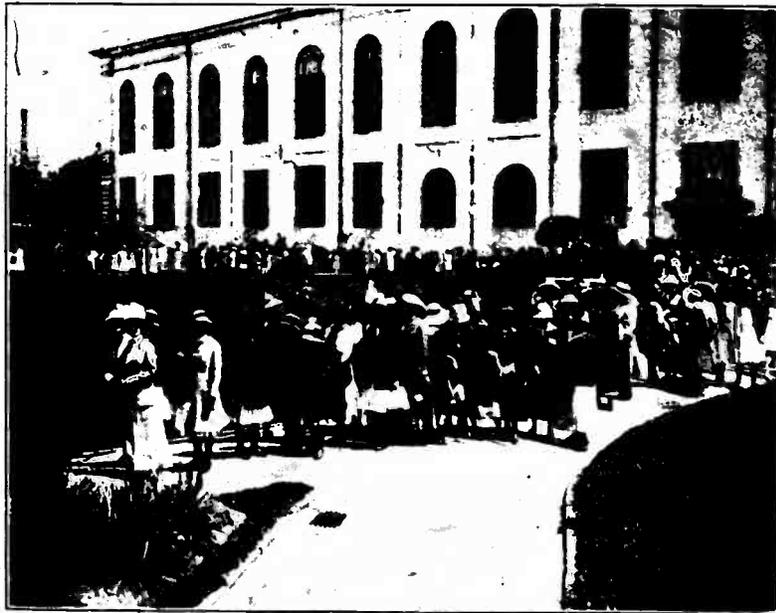


B. THE JAPANESE EXHIBIT.

Includes samples of many varieties of rice, articles made of rice straw, etc.; also models of men and women in their ordinary clothing, the houses in which they live, and many things connected with their daily life.



A. FOREIGNERS VISITING THE MUSEUM.

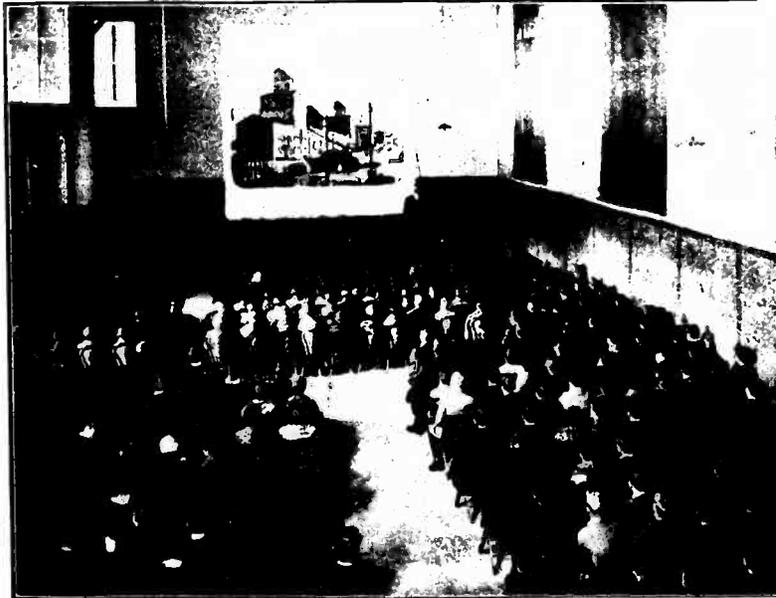


B. NORMAL SCHOOL GIRLS ON THEIR WAY TO THE LECTURE ROOM.



A. GOING TO A LECTURE AT THE COMMERCIAL MUSEUM.

Often 10 special trolley cars chartered by the schools wait on a side track for two hours while classes hear a lecture and study exhibits.



B. A LECTURE ON ARGENTINA.

The picture on the screen is a colored lantern slide of the grain elevators at Buenos Aires. The lecturer is explaining the importance of the wheat industry in Argentina and the wonderful shipping facilities of the Rio de la Plata. A typical daily scene.

BULLETIN 1920, No. 13, PLATE 6

BUREAU OF EDUCATION.

BUREAU OF EDUCATION.

BULLETIN, 1920, No. 13 PLATE 7.

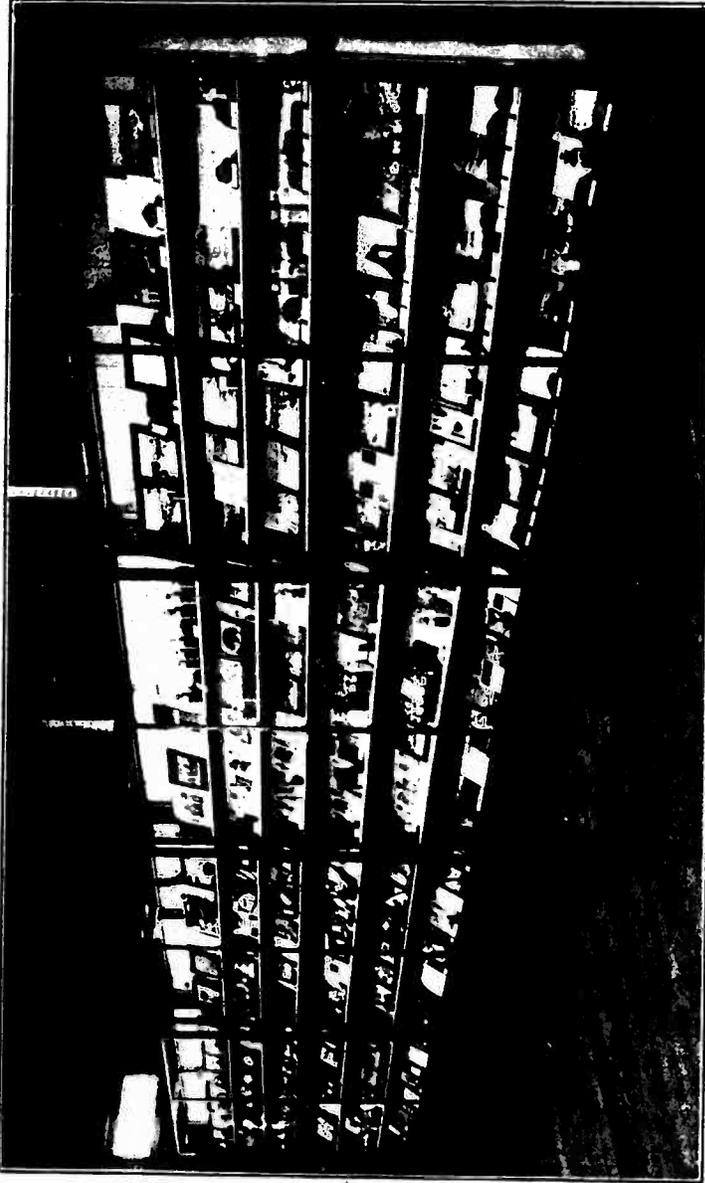
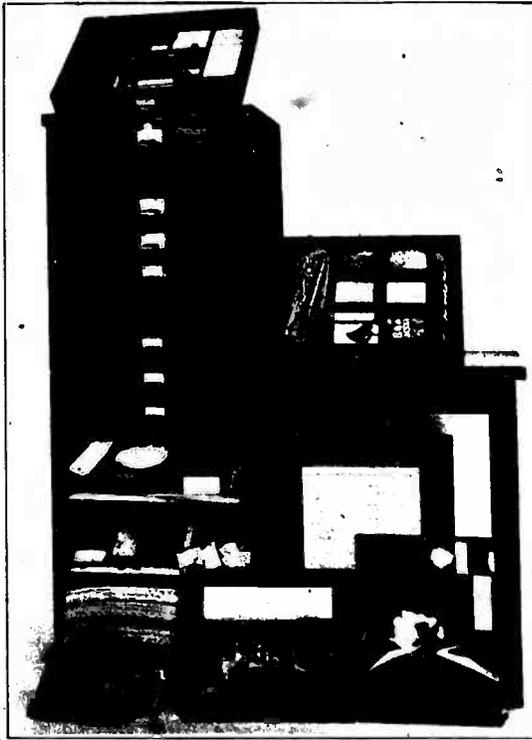
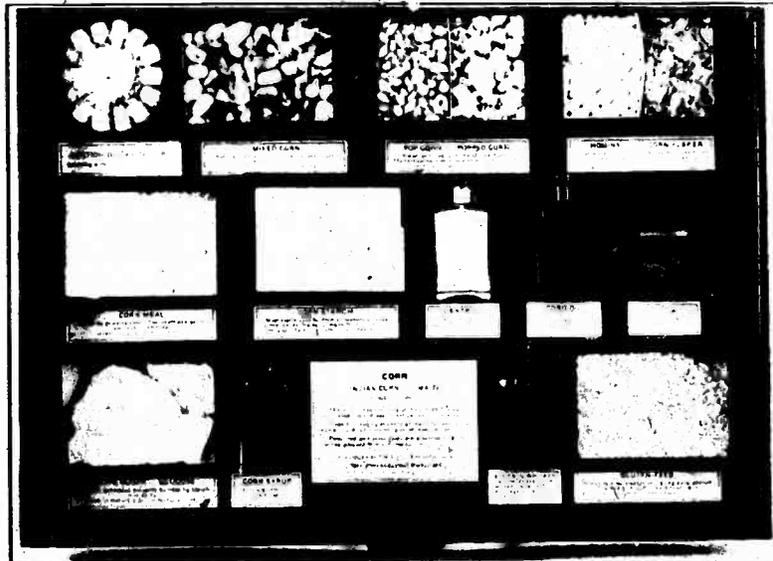


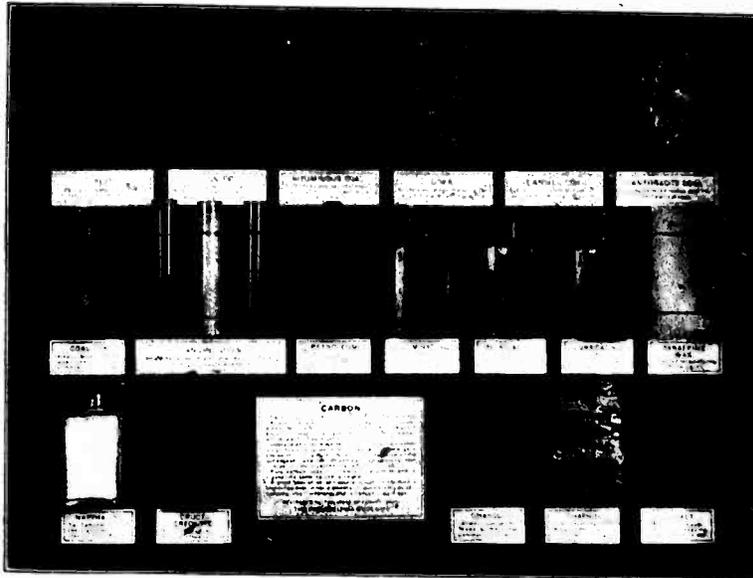
EXHIBIT OF COMMERCIAL PRODUCTS IN SYSTEMATIC ORDER FOR THE USE OF HIGH SCHOOLS.



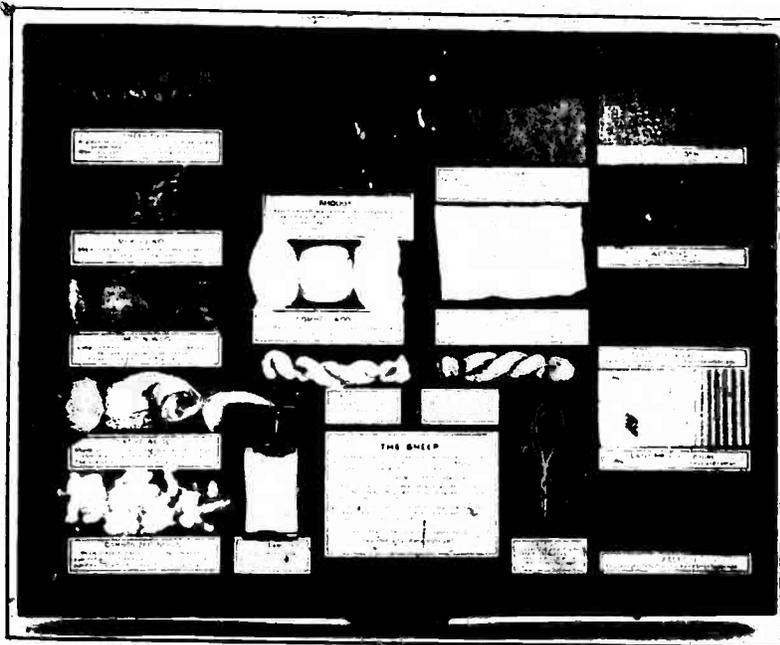
A. IMPORTANT MATERIALS OF COMMERCE.



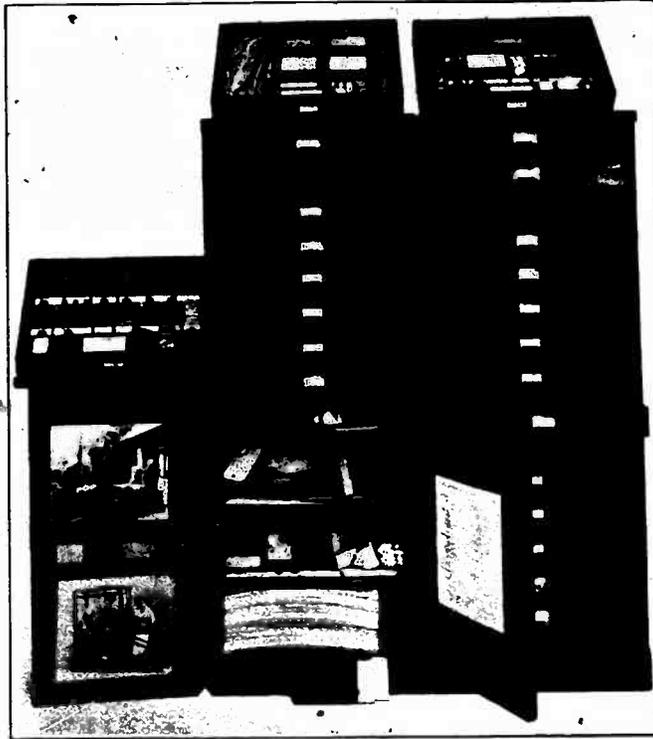
B. THE CORN DRAWER.



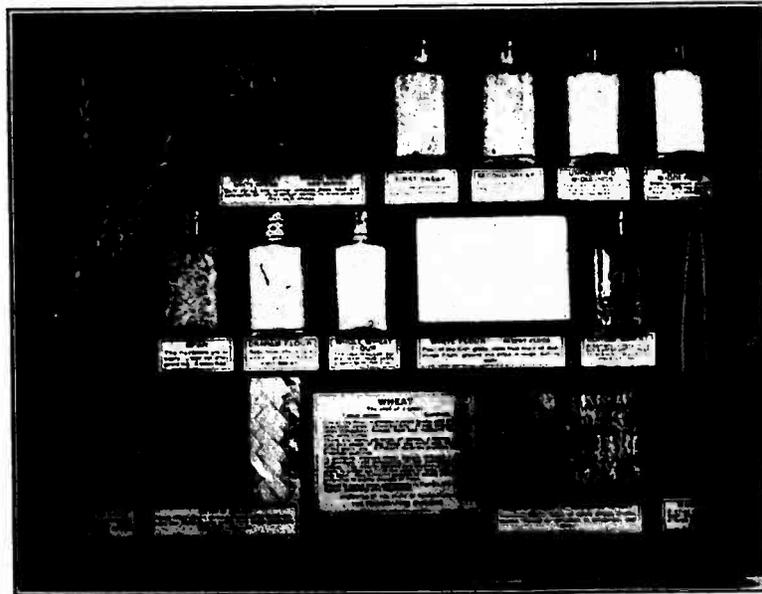
A. THE COAL EXHIBIT.



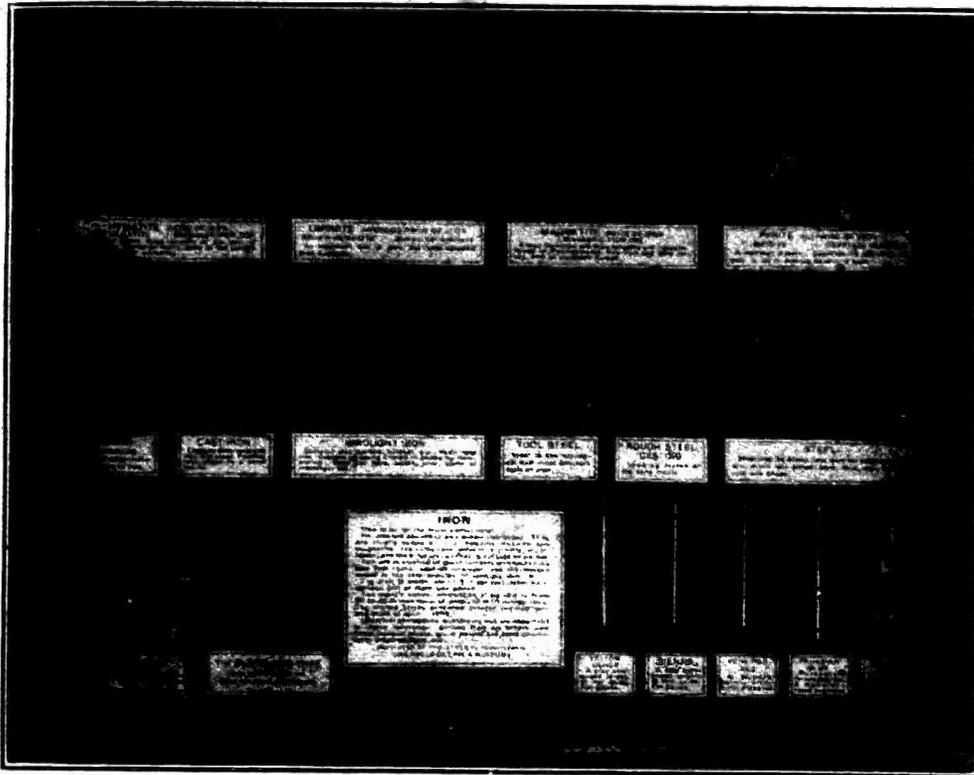
B. THE WOOL EXHIBIT.



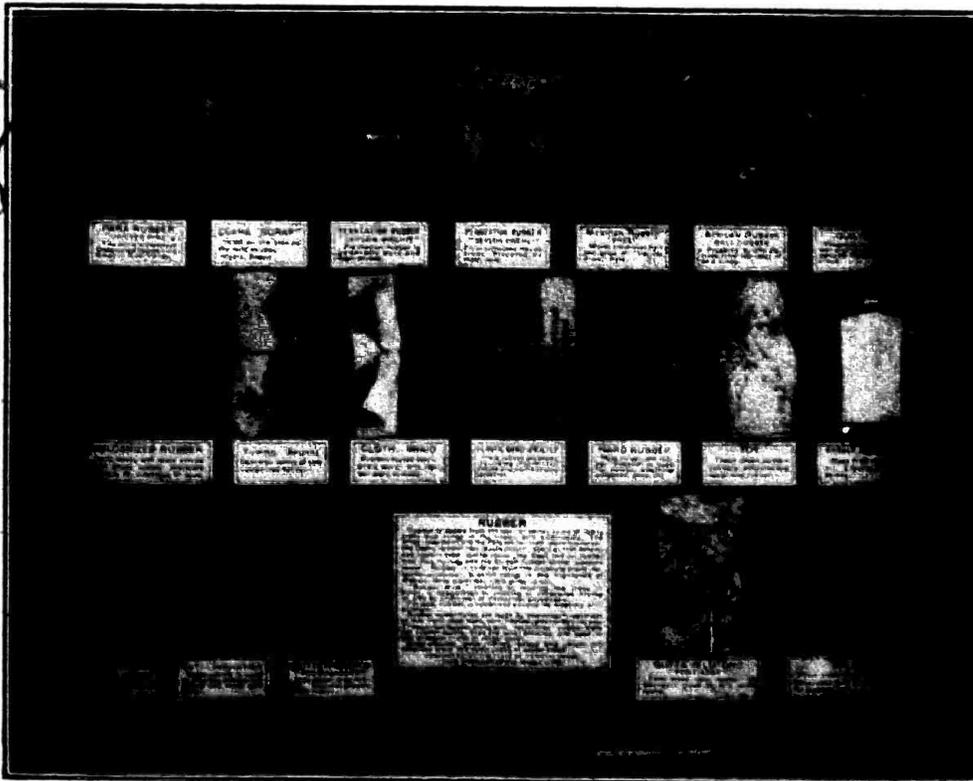
A. PHOTOGRAPHS OF THE CHIEF PRODUCING INDUSTRIES.



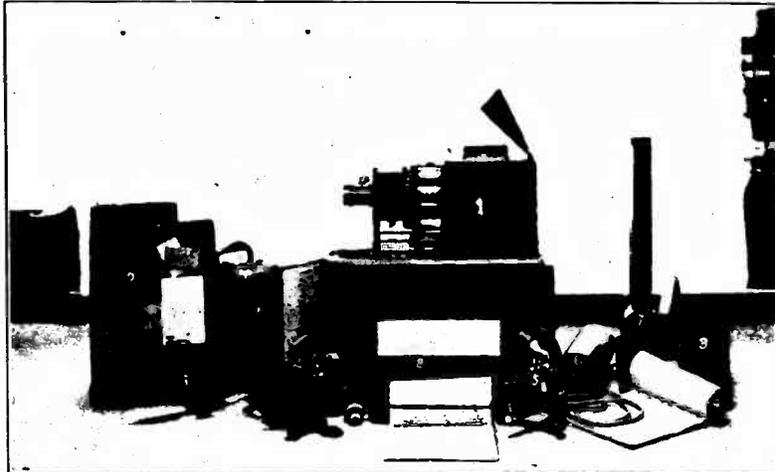
B. THE WHEAT EXHIBIT.



A. THE IRON DRAWER.



B. THE RUBBER EXHIBIT.



A. THE LOAN LECTURES.

Showing (1) lantern, (2) incandescent electric lamp, (3) arc lamp, (4) rheostat, (5) acetylene burner, (6) acetylene tank, (7) kerosene lamp and chimney, (8) set of lantern slides, (9) type-written lecture, and (10) packing box. This outfit, accompanied by clear instructions is loaned free to public schools in Pennsylvania.



B. COLLECTIONS FOR SCHOOL INSTRUCTION.