SCIENTIFIC AMERICAN

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THE MANUFACTURE OF PHOTOGRAPHIC APPARATUS.

Among all the pleasures enjoyed by old or young, we know of none more rational and elevating than that of photography. It inevitably cultivates the love of nature, elevates the standard of taste, beautifies the home, gives pleasure to one's friends; it brings to those who practice it new associations, and tends to break up the monotony of life and fill in the hours which, in all probability, would otherwise be wasted.

Photography is a grand science, of great value to the world as practiced by professionals, and it now has relations to very many of the arts and sciences. Its present and prospective capabilities will never cease to be a wonder to us. The popularization of photography and its extended practice by amateurs has, therefore, in a natural way, given rise to a number of industries of no inconsiderable importance and of large account in the aggregate. One of these industries forms the subject of the accompanying illustrations. They represent an establishment where are made cameras of every grade and size, from the first-class instruments used by professionals and many amateurs down to the simplest outfit. It would require a volume to adequately describe all the details of the business, running as they do into many quite distinct specialties, but we will note a few of the leading features.

The business requires the entire room of a factory structure 60 by 124 feet on the ground and five stories high, with a separate boiler house, in which are placed the boilers, having the latest improved Hawley down-draught furnace. The machinery of the works is driven by a 120 horse power Corliss engine, and every improvement that modern invention has developed in machinery for working wood and metals has been adopted, not only as an economic measure, but also to insure work of the best style and finish. The building, as will be seen by the illustration, is a modern, substantial factory building, with ample light and excellent ventilation; in fact, it is a model building for manufacturing purposes, in the construction of which the comfort and convenience of the workmen have been considered.

In Fig. 2 is shown an interior view of the woodworking shop, in which are made the cases and all the varied styles of woodwork required in the more or less expensive instruments. Perhaps it will not be necessary to go into the details of all the machinery used by this department, as, with the exception of a few special tools, it is much the same as that found in first-class cabinet factories.

The metal-working shop, which forms the subject of Fig. 3, is the department from which is turned out all the carefully made and well finished metal parts which are so noticeable a feature of optical instruments. Many of these metal parts being of peculiar form require special tools, which have been devised for this particular use. The

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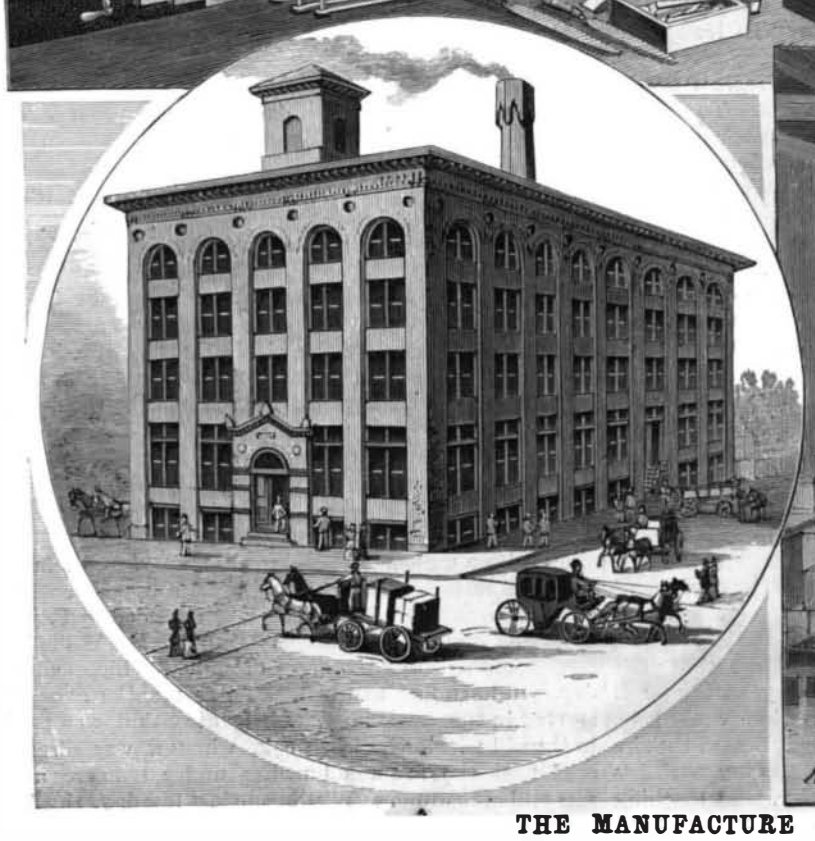

THE MANUFACTURE OF PHOTOGRAPHIC APPARATUS

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remaining illustration on our first page shows the hand camera department, in which are put together the various kinds of hand cameras for which this establishment is noted. We give illustrations of some of these hand cameras to show their convenient form when in use and their compactness when folded.

The Premo, shown in Fig. 5, is a complete and practical hand camera, having all the recent improvements, including the swing back and rising and falling front. It is arranged to receive a tripod on two of its sides. The view finder is attached to the bed, and is reversible. The ground glass screen has a new device, which prevents it from closing on the withdrawal of the plate holder, so that the latter may more readily be reinserted. A touch on the spring button closes the screen for focusing, and causes it to exert a pressure on the holder. Either glass plates or cut or roll films may be used in this camera.

Fig. 5.—PREMO HAND CAMERA.

Fig. 6 represents the long focus Premo closed, opened as an ordinary folding camera, and also arranged for extremely long focus. This is a new device, which will be readily understood and appreciated by the photographer, who has often failed of securing possible results for the want of a few inches more of camera bellows.

We give in Fig. 7 an illustration of a Premo camera adapted for stereoscopic work. This camera is designed to keep pace with the reviving interest in stereoscopic views. The stereo lenses are matched and provided with a double shutter, designed especially for this use.

Fig. 7.—PREMO FOR STEREOSCOPIC WORK.

In Fig. 8 we give an illustration of the Carlton twin lens camera. This instrument will be appreciated by those who desire to practice photography under the most favorable circumstances. It has two lenses of the same focus, one placed above the other, the lower one forming the picture on the plate, while the upper one forms an image on the ground glass at the top of the camera, the glass being of the same size as the plate. The ground glass screen is covered by a lid, which, when raised, forms a shield at the top and sides, which renders the image very distinct and clear. The lid has a mirror on the under side, which is used for viewing the image when the camera is reversed for vertical views.

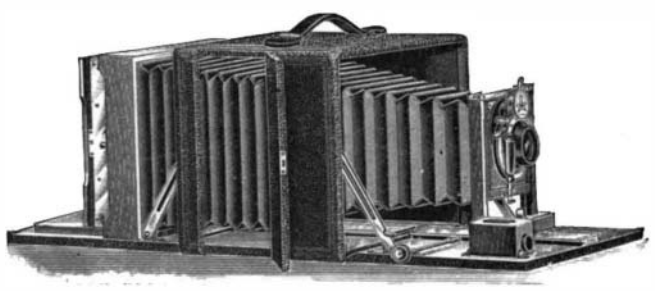
The folding Premier, one of the standard instruments made in this establishment, is known the world over as a first-class practical camera. It has a fine lens and an efficient shutter. It is a favorite form of camera among amateurs.

In Fig. 9 we have shown some of the fine large cameras made at this factory. While these cuts give an idea of the shape and general appearance of these instruments, they do not convey a fair impression of the finish.

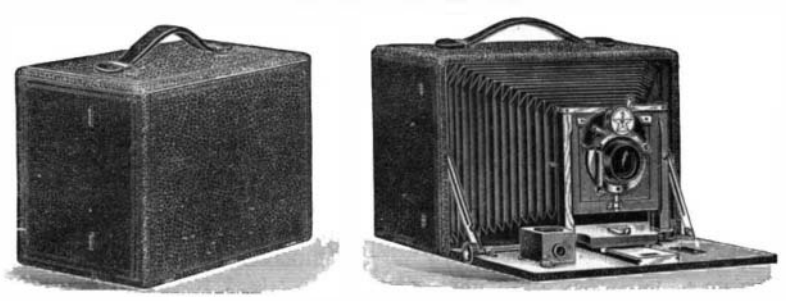
In Fig. 10 we have shown a view in the testing department, where every camera is subjected to severe tests, both as to its mechanical and optical parts

In Fig. 11 we give a view in the shipping department, which conveys an idea of the activity which here prevails. Besides the various kinds and sizes of cameras made at this factory, there are a number of excellent forms of tripod, adapted for the several forms of camera; also plate holders, printing frames, and a large number of accessories manufactured by them.

The Rochester Optical Co., of Rochester, N. Y., whose factory forms the subject of our sketches, was founded and is owned and managed by Mr. W. F. Carlton, who has shown great business enterprise and acumen in discerning prospectively the needs of both professional and amateur photographers, thereby gaining for himself a large and well deserved patronage.



OPENED FOR VERY LONG FOCUS.



CLOSED. OPEN.

Fig. 6.—LONG FOCUS PREMO CAMERA.

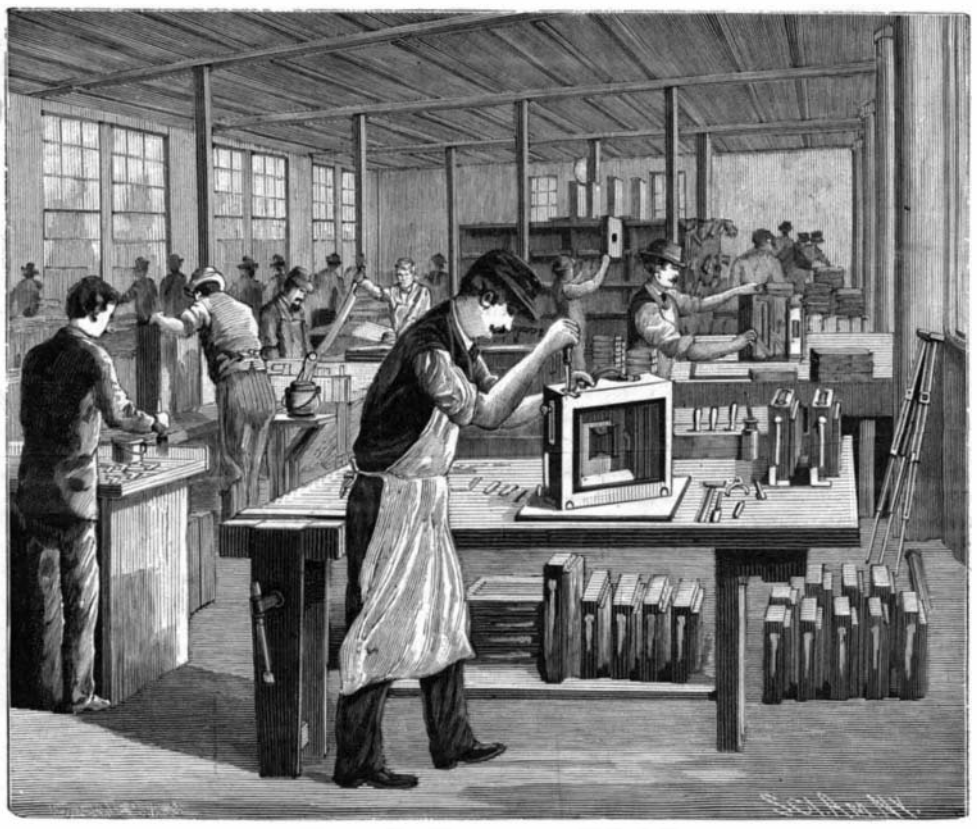


Fig. 9.—FINISHING LARGE CAMERAS.

The Scientific American Cyclopedia of Receipts.

The Home Journal for July 3, 1895, says of the SCIENTIFIC AMERICAN Cyclopedia of Receipts, Notes and Queries: "After a use of several years, we can say that we know of no single volume which contains such a large body of practical information of value to the household in all its departments and to the amateur craftsman or mechanic. Not a single receipt has failed, nor is there an imaginable inquiry within the realm of domestic science or industry to which this book does not satisfactorily respond. It is a volume that will save its cost many fold, while to open and read it at random is to make an invariable and certain addition to one's knowledge."

Fig. 8.—CARLTON TWIN LENS CAMERA.

A SMALL electric lamp is being used instead of a bell in some telephone exchanges in England. The call for connection lights the lamp.

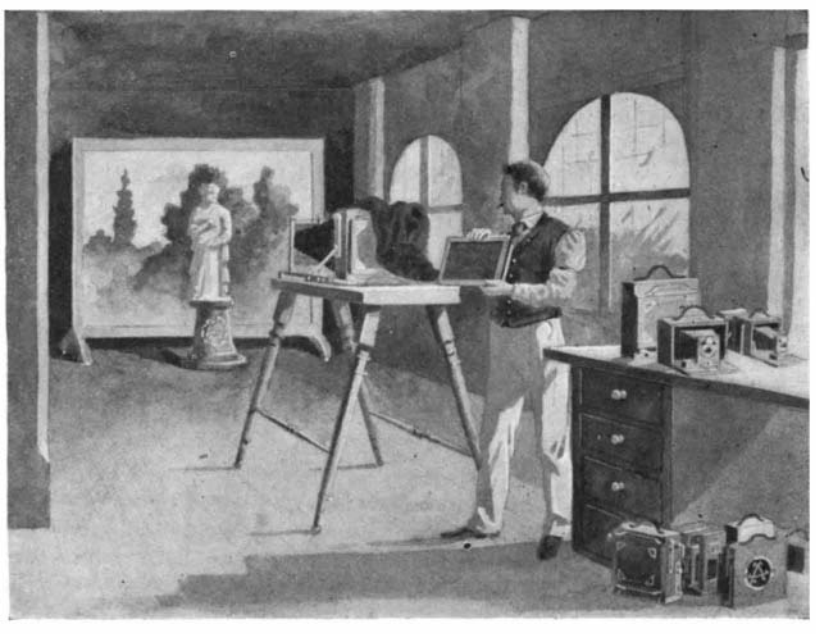


Fig. 10.—TESTING DEPARTMENT.

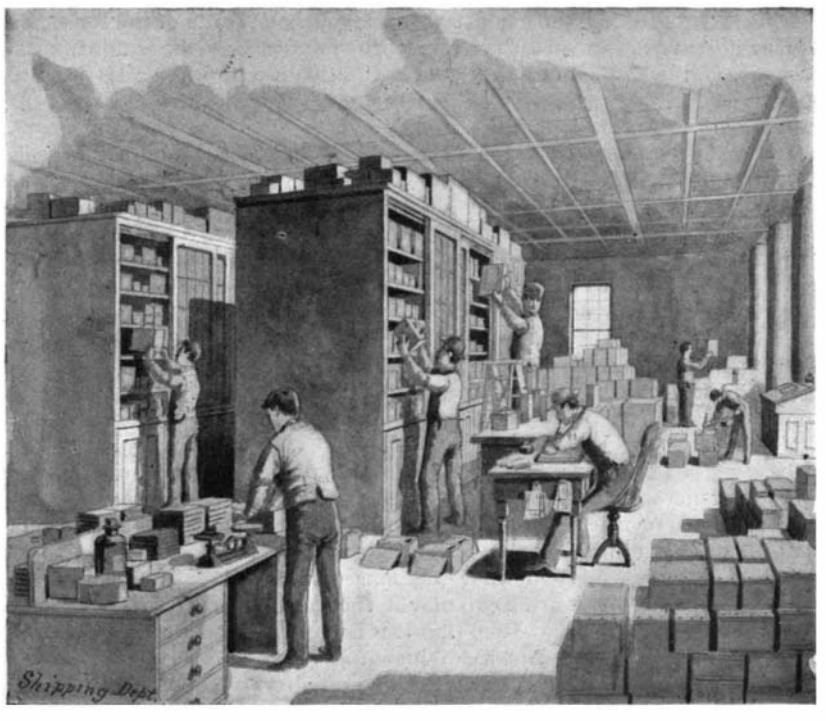


Fig. 11.—SHIPPING DEPARTMENT.

Machinery as an Educator.

In looking at a complex piece of machinery, such as the great triple-expansion engines of a high-speed modern ocean racer, the first feeling of the uninstructed layman is apt to be that of confused awe. The huge mechanism appears to him as a leviathan, a great brute force, trained by man and under his control, but yet ready to strike down ruthlessly any one who shall get in its way. Education is about the last function that one feels ready to attribute to it. Yet in the Engineering Magazine, May, Alexander E. Outerbridge, Jr., tells us that a machine is a great educator, and he ranks its work in this line as of a very high grade. His ideas, which are worthy of careful attention, are given in the following extracts which the Literary Digest quotes from his article. The Literary Digest, by the way, is one of the most interesting weekly papers that comes to this office.)

"An impression prevails in the minds of many intelligent people, more especially, perhaps, among those who are not directly engaged in mechanical pursuits, that the tendency of modern methods of manufacture in the substitution of machinery for hand labor is detrimental to the intellectual development of the wage earner, in that it makes him an automaton, like the machine which he tends; that the workman in a great factory loses his individuality; that the handicraftsman of a former generation has disappeared, and that his successor is a mere marionette, to whom the gift of brains is a superfluity.

"It is the object of this paper to present briefly a different and, in some respects, a novel view of the educational influence that machinery exerts upon the mental and moral development of the workingman, and to show that the introduction of new inventions, so far from being an oppression to the wage earner, is, in fact, his greatest boon. These conclusions, which are the result of daily observation for a number of years in a large industrial works, are at variance with the opinions of those theorists and ecouomic writers who maintain that mechanical occupation is necessarily narrowing to the intellect. . . .

"I am satisfied that an insensate machine, in the material combinations of which, however, the skilled designer 'has embodied his own mental faculties, so that it is constrained to do his will when power is applied,' performing accurately the most complex operations, exerts a stimulating educational influence upon the care-tender, even though he may be an illiterate man or boy entirely unconscious of this influence. If you give a boy of average capacity the simplest routine work to do in connection with a machine—it may be merely to feed it with raw material—he will, at first perhaps, perform his task in a perfunctory manner, taking little interest in the work and having no comprehension of the mechanism of the machine. Little by little, however, the constant repetition of mechanical movements, producing always one uniform result, impresses itself upon his latent powers of observation and comprehension, the underlying principles and heretofore hidden motive of the seemingly inexplicable combination of wheels and gears is revealed, and simple order is evolved out of complexity; a new interest is developed and the boy becomes an intelligent operator. . . .

"The educational influence of mechanical occupation upon the workingman is strikingly illustrated in another manner. You will find in all large industrial establishments employes who exhibit as much skill in their special work as that of well known original scientific investigators; they are daily performing operations as delicate in their way as the work of the microscopist, and with a degree of accuracy amazing to the novice. Take, for example, the simplest operation of calipering a tube or measuring a rod, and you will find mechanics dealing quantitatively with minute fractions of an inch which ordinary people totally disregard."

That all this close relationship between machine and operator has its educational value no one can doubt. But Mr. Outerbridge goes farther, and pursues his subject into a realm that harsh critics might be tempted to call that of fancy. A machine, he says, is in a certain sense the representative of the human mind that conceived it. He states this as follows:

"I believe that every novel machine possesses something of the personality of its creator. I believe, furthermore, that it is possible to trace through the machine, back to the inventor, a positive and continuing influence of his mind upon the mind of the operator.

"I believe that the special mental development of the present generation of American engineers and mechanics may also be traced through historical relics to the subtile quality of mind with which famous American inventors have endowed their creations. These forces have been silently working to mould the minds of men in characteristic grooves, so that it is as impossible to mistake a purely American machine for a foreign production as it is to mistake a Chinaman for an Indian. This characterization may be even more sharply defined. It is not an unusual observation among mechanical experts to-day that machines produced by one establishment may often be distinguished from similar machines of another make (without the aid of any name plate) through a peculiar 'something' which the Frenchman expresses with a shrug and 'Je ne sais quoi.'"

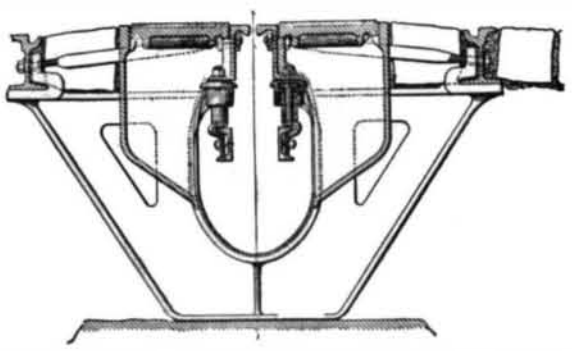
THE ELECTRICAL CONDUIT SYSTEM IN NEW YORK CITY.

In the city of New York some of the principal lines of street railway cars are at present operated by wire rope cables. This is an effective system when it is in good running order, but it is liable to breakage of wires, causing frequent interruptions, during which all the cars on a given section come to a standstill.

In the northerly section of the great city the overhead trolley has been introduced. But in the southern or more thickly populated portions, such trolley is considered undesirable, and a new electric line, in which the electric conductors are placed underground, has lately been inaugurated and the working proves to be highly successful.

The conductors are arranged within a slotted tube or conduit, which is located in the middle of the track. The appearance on the surface of the ground is similar to the cable system.

Projecting down from the floor of the car into the slot is a bar or plow which presses against the flat surfaces of two iron conductors running the entire length of the conduit. These conductors are placed each three inches on each side away from the center of the slot, to avoid deleterious effects of any drip which would otherwise reach them, and are of channel iron four inches deep and thirty feet long. They are suspended from the ceiling of the conduit by means of insulators devised for this especial purpose, and are at a depth of thirteen inches below the conduit slot.



NEW YORK ELECTRICAL UNDERGROUND CONDUIT SYSTEM—SECTION OF CONDUIT—INSULATOR SUSPENSION.

Each conductor is sufficiently rigid to require suspension at the ends and centers only, and the ends being located in the manholes, and handholes being placed at the centers, inspection and repairs are rendered comparatively easy. The conductors are bonded to each other by stranded copper wire securely riveted into the web of the metal.

The new line is constructed on Lenox Avenue, and extends from 108th Street to 146th Street, a distance of 2½ miles. The present power plant consists of two 650 horse power engines and 400 kilowatt generators. Steam is supplied from two Babcock & Wilcox water tube boilers arranged in one battery. Each has a rated capacity of 250 horse power, furnishing steam at 120 pounds. The engines are horizontal cross compound Allis-Corliss machines, which during the experimental trips are run non-condensing. All the steam piping is placed beneath the floor of the engine room. To each of the engines is coupled a General Electric 400 kilowatt generator of standard construction, but wound for 350 volts instead of 500 volts, as is the usual practice in railway work. The conduit was built along the grade of the street, but with sufficient pitch to permit any water flowing into the conduit to find its way into the manholes located every 30 feet, and from thence into the sewers.

The current does not return by means of the rails. Each conductor forms one side of the working circuit. The current merely rises on one side of the plow, passes through the controllers into the motors, and after performing its duty returns by the other side to the opposite or negative conductor.

The plow or traveling contact arrangement is also essentially novel. It consists of two pieces of iron, one on each side of the plow, supported on spring leaves which cause them to press outwardly against the two conductors. The plow is suspended from a longitudinal bar bolted to cross beams set upon the track, and is constructed of two sheets of steel laid each one upon a plate of fiber. The two sheets of fiber are then brought together, inclosing strip copper conductors connected at the top to the motor cables and at the bottom riveted to two other pieces of sheet steel. These run on each side of the plow and serve as supports for the hinges which carry the sliding contact pieces. A heavy sheet of fiber continues downward and serves to separate these contacts.

The motors employed are the standard General Electric 800 machines, handled by "K²" controllers. The cars which are used on the line were constructed by the John Stephenson Company, and are mounted on standard cable trucks constructed by the Peckham Motor Truck and Wheel Company. The cars are brilliantly illuminated at night by means of incandescent electric lights.

The Greek Language.

Dr. Achilles Rose, in a paper recently read before the New York County Medical Association, says:

"The study of the classics, especially the Greek, has been greatly favored in this country during the past years by the establishment of an American school at Athens. This school was founded in October, 1892, by the American Archæological Institute, and is supported by yearly contributions from eighteen universities in the United States. One result of the establishment of this school has been the gradual diffusion among cultivated people of a more correct notion of the Greek language, and of the appreciation of the fact that it is not a dead, but a living language, and that what is spoken to-day by seven millions is practically the same tongue that was used by Plato, Demosthenes and Plutarch.

"It is conceded that the study of the classical languages, and of the Greek more especially, cannot be dispensed with: it is the attribute of every cultured mind, the attribute of every true scholar; it is conceded that the classics are powerful means to elevate, to ennoble our mind, our character. Greek is and should remain on the school plan. Only another, a rational method of learning it, has to be adopted; it has to be learned practically, for practical purposes as well as for ideal. The most perfect, the ideal language will then speak for itself, and will inspire scholars to unite in agitation for its general adoption.

"Journals and new books are published regularly in Greece at the present day, and any one versed in ancient Greek need but to examine one of these publications fairly and without prejudice, to be convinced that their language is the same as that of the Anabasis or of the New Testament. There are differences, it is true, but they are merely in the way of simplification, such as every language—every living language, that is to say—undergoes in the course of time.

"The fact that the Greek language alone has preserved itself in all its original beauty through thousands of years is, to quote a modern Greek writer, 'Because the beautiful is like the sunshine upon this world—because the beautiful lives forever.'

"The Greeks of to-day speak a language which Pericles, Socrates and Phidias would undeniably have understood. An unbroken chain stretches from those times down to the present. The Greek language is indeed immortal.

"The pronunciation of Greek, as taught in our schools—which differs in a remarkable degree from that of the present inhabitants of Greece—lacks every scientific authority. The method of instruction in Greek in our schools and colleges is faulty.

"In order to have command of a language, it is, above all, necessary to know how the people speak; we must become familiar with the everyday language. Whoever is acquainted with the language of conversation of a people has the key to its literature as much as the natives themselves have.

"Greek taught like other living languages, by one or the other of modern methods, is not more difficult to learn than French or Spanish, certainly less difficult than German.

"Let us have a Greek school here in New York, with natives of Greece as teachers, with children of immigrated Greeks, with Greek as the language of the house, where our children can learn Greek just as they can learn French or German in French and in German schools in this our city."

Metal Workers of Asia.

Among the half civilized peoples of Central Asia are many artistic workers in metals. One of these nations or tribes, the Burates, is famous for inlaid work. The Russians call these workmen "Bratskaya Robata." They use gold, tin and silver for inlaid work on iron. The art has been practiced by them for thousands of years, and their skill has been recorded in the ancient folk songs of Asia. A writer describing their work says they hammer the silver, gold or tin very thin. Then the part of the object to be inlaid is made rough with a hammer, the surface of which is roughened like a file. Templets of birch bark serve to cut the metal into the proper shape, which is laid upon the heated object and lightly hammered into the rough surface, then heated to a blue color, and the inlaid metal is hammered smooth with a polished hammer.

The "Climax" Bicycle Watch and Holder.

In our illustrated notice, of May 18 last, of this device by Messrs. Ingersoll & Brother, 65 Cortlandt Street, New York, we omitted to state the price of the article, which is $2.50. This includes the timepiece. Every cyclist will appreciate the convenience of the article and its low cost.