

insoluble in metals and unoxidizable. Siloxicon possesses all these qualities. At present most metallurgical operations are conducted with high-grade fire clays. These have been improved upon by the use of chrome, silica, and magnesia, but the best of these fall far short of active needs, because of their low melting points or the reaction between the slags. As siloxicon is formed at a temperature of from 4,500 to 5,000 degs. F., it is unaffected by a lower temperature, so that it cannot be touched injuriously by the heat of any flame or fuel combustion. Where oil is used as fuel, siloxicon will be received as a great boon, because it will not melt under the intense heat thus formed.

Crucibles have already been made of siloxicon, and if it proves the marvelous success expected in this field, it will do away with the necessity of going to Ceylon for crystalline graphite. The importance of this is best illustrated by the fact that in 1901 the consumption of Ceylon graphite in the United States amounted to \$1,031,289, the greater part of this expenditure being in the steel crucible work.

In one of the illustrations the first furnace for the commercial manufacture of siloxicon is shown, while in another illustration is pictured the form of siloxicon as it is taken out of the furnace. To the left in this illustration will be seen two crucibles made out of the new material.

**THE TELEPHONE AND THE BRITISH POST OFFICE.**

BY HERBERT C. FYFE.

I was privileged the other day to witness the working of an invention which has already been described in these columns and which is likely to prove of immense value to many different classes of the community. The "telegraphone" is a "recording telephone," that is to say, a telephone that records and reproduces messages spoken into it.

The photographs illustrating this article were specially taken when the telegraphone was being exhibited at a recent conversazione of the Institution of Civil En-

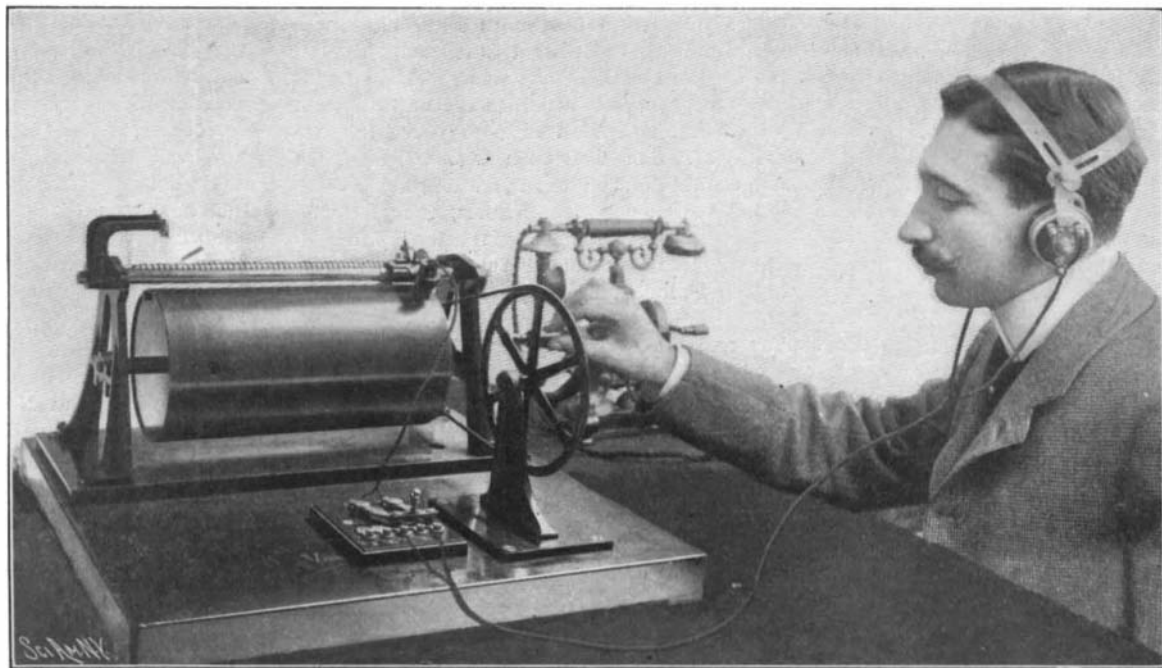
gineers. Thanks to the submarine cable, messages can be sent to and received from all parts of the earth, and the purchaser of a halfpenny evening paper can read of events happening in every quarter of the globe. The telephone cannot as yet rival the telegraph, but each year the distance increases, and telephoning under the sea is now possible across the Channel. While the telephone has done much to facilitate communication in cities and large towns, it cannot be denied that there

are many drawbacks connected with its use. Nothing is more annoying to find, after you have succeeded in "getting through" to the person to whom you wish to speak, that the individual in question is "not at home" or "busy." The telegraphone records the message, so that it can be read by the recipient after he has returned or is no longer "busy."

The advantages of the telegraphone over the telegraph are many. It is much easier to speak than to write, and the telegraphone does your writing for you. The message takes less time to go, there is no chance for mistake, because your words are automatically recorded, and you can make your message so private that it is known only to the person for whom it is intended. The telegraphone, as readers of the SCIENTIFIC AMERICAN know, is the invention of Herr Valdemar Poulsen, a Danish electrician, and was exhibited at the Paris Exhibition of 1900. Briefly, the Poulsen telegraphone enables a telephonic conversation to be permanently recorded on a steel wire and reproduced at any time. The manner of working is as follows: A steel wire or a steel band is moved by any suitable means at a considerable velocity between the poles of a small electro-magnet. The steel wire is wound on a cylindrical drum and receives the record in the form of magnetization induced on it by a small two-pole electro-magnet which is used in place of the telephone receiver of an ordinary telephone circuit. The magnet travels along horizontally, touching the steel wire, while the cylinder revolves as in a phonograph.

On speaking into a telephone transmitter joined on the circuit at one end of the line, the undulatory currents set up on the transmitter react upon the electro-magnet and cause a continuous variation in the direction and in the degree of magnetism at the poles of the electro-magnet. These variations are permanently recorded on the steel wire as it rushes by, and when the message is complete, the steel wire retains a definite record of what has taken place in the shape of a continuous series of transverse magnetized lines varying throughout in their polarity and in their strength. On connecting a telephone receiver to the electro-magnet and again starting the steel wire on its course, this magnetized wire generates electric currents in the coils of the superimposed magnet as it passes between its poles, and these electric currents, which are the exact counterpart of those generated by the original wire, cause the telephone to repeat what was said in an almost absolutely perfect manner. The record can either be permanently kept for future reference or it can be obliterated in such a way that the steel wire can be used for fresh messages. In the latter case the same magnet is again employed, a continuous current being passed around its coils by the microphone battery, whereby turning the wire past the magnet as before, all trace of the record is removed. When very long messages require to be sent, a special "steel ribbon telegraphone" is requisitioned. In this a flat steel ribbon is employed, and run off from one reel to another, across the poles of the electro-magnet. As in the case of a phonograph, the cylinder may be turned by hand, by clockwork or by a motor. The cylinder on which the wire is wound is 140 mm. in diameter, 265 mm. long. On it are 150 turns of steel piano wire, 1 mm. diameter and 1.2 mm. pitch.

The articulation of the telegraphone is almost perfect and a vast improvement over that of the phonograph. The voice is reproduced quite clearly and free from disturbing noises. Mr. Poulsen says that a message, speech, songs, etc., inscribed on the wire may be reproduced indefinitely without any perceptible diminution in clearness; the tone of the voice remaining perfectly distinct. Sir William Preece, at a recent meeting of the Institution of Electrical Engineers, said that the greatest novelty in the telegraphic and telephonic line that he had recently seen was the telephone of Mr. Poulsen. It was, he said, a very marvelous thing, and bound to come into use. "It is not only in itself," said Sir William, "beautifully designed and based on beautiful principles, but it is one of those things that is going to open the eyes of all our physicists, scientists, and theoretical men on the question of the molecular character of magnetic and electric operations."



USING THE TELEPHONE AS A PHONOGRAPH.

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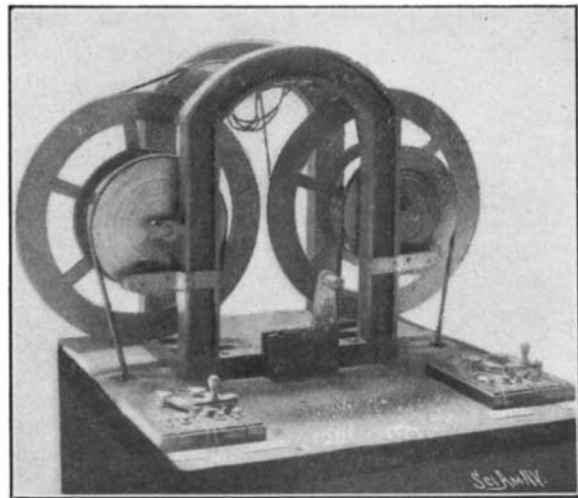
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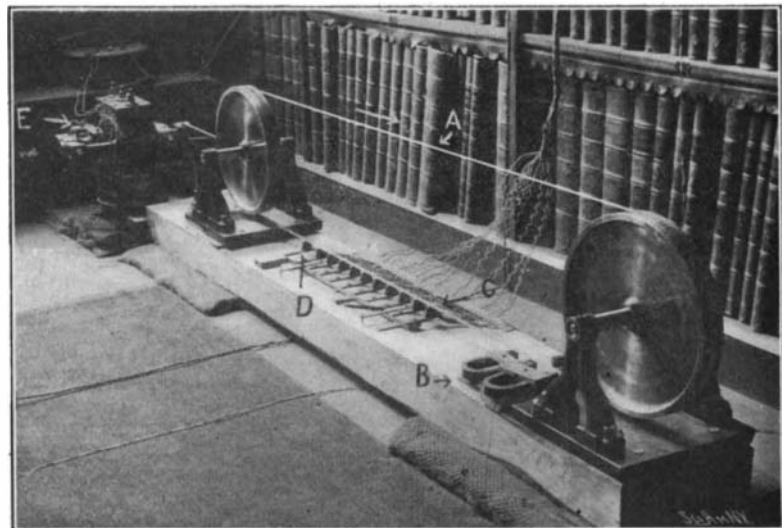
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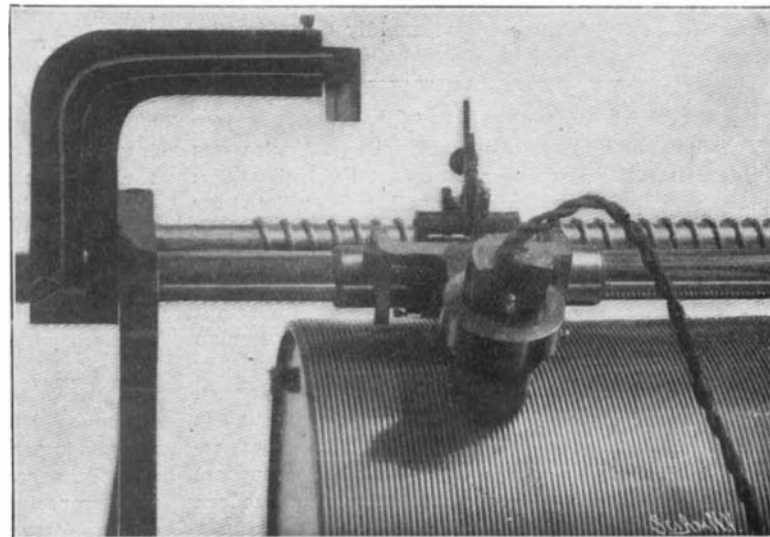


A LARGE TAPE TELEPHONE FOR RECEIVING MANY MESSAGES.

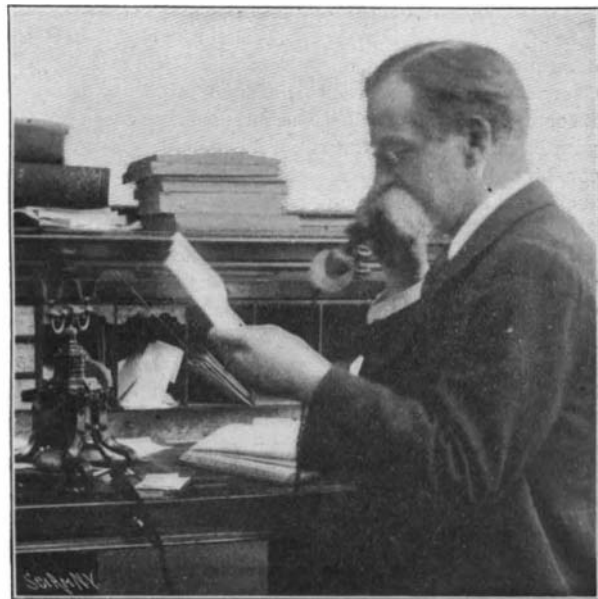


A, endless steel tape; B, wiping-out magnets; C, recording electro-magnets; D, reproducing magnets; E, electric motor.

RIBBON TELEPHONE EXHIBITED AT THE LONDON INSTITUTE OF CIVIL ENGINEERS.



DETAIL OF THE CARRIAGE AND MAGNETS.



A DESK TELEPHONE.

The man of business who has to leave his office for a time simply places the telegraphone in its place and goes away. When he returns he finds that all the messages that have come for him have been recorded with absolute fidelity on the steel band, and he has only to connect the telephone receiver to the instrument and hold the receiver to his ear to hear the words that have been spoken days or weeks before. Such records will be of great value, for at present confusion and trouble have arisen from the fact that verbal messages or orders have to be relied upon. Besides, it is often very inconvenient to leave one's work or interrupt an interview to attend to the telephone.

In an article which he recently contributed to the *Electrician*, Mr. Poulsen hinted that it would be possible for the telegraphone to record several messages at once and to reproduce them all separately afterward. At present no details of this arrangement have been made public.

Besides its use as a recording telephone, there is another and even more important use for the telegraphone, and this is as a telephone repeater or relay. Relays are used in long-distance telegraphic cables because the currents are not strong enough to work the receiver directly, and have to be passed through a series of relays in order that they may do their work. For the past twelve years the electrical world has been seeking for a satisfactory telephone relay, such as would make speech between London and New York and other distant places possible, but so far the problem has not been solved.

A telephone repeater would of course increase the range of telephonic speech and decrease the cost of long lines, and it may be mentioned that the president of one of the American telephone companies some time ago offered publicly a reward of \$1,000,000 for a thoroughly satisfactory telephone repeater, but no one has yet earned the money.

In conjunction with Mr. E. S. Hagemann, Mr. Poulsen has endeavored to adapt his invention to act as a telephone relay, and we believe that excellent results have been obtained.

Yet another use for the telegraphone is for the multiple transmission of the same sound, whether it be a speech, message, musical performance, etc. This is of course at present accomplished by the ordinary electrophone or theatrophone, but if the telegraphone be substituted, the transmission can be extended to a far greater number of lines, as an indefinite number of telephone receivers may be connected to the telegraphone.

It is Mr. Poulsen's idea to start a "telephone journal," by means of which news will be transmitted by telephone to numbers of subscribers.

#### The Navy League of the United States.

There has recently been organized in the United States a Navy League, whose object is to secure a navy commensurate with the country's requirements. To this end it proposes to draw public attention to our naval standing relatively to the navies of the world, and to create a public opinion on the question of naval increase that will react favorably upon Congress when it comes to legislate on naval affairs. Leagues of this kind already exist in England, France, Germany, and Italy, and in every case they are non-partisan and possess no political significance whatever. As an instance of the work done by similar organizations in other countries, we may take the case of Germany, where the impetus given during the past few years to naval affairs is attributed largely to the influence of the Naval League, in which the German Emperor himself is an indefatigable worker. The German League has gone into the matter with the thoroughness that characterizes the German people in dealing with matters of national importance. The aims of the new League are highly commendable, and we trust that it will be successful in assisting forward the good work of providing this country with a navy adequate for the protection of its worldwide and rapidly extending interests.

#### The New Campanile of Venice.

The first stone of the new campanile of Venice was laid April 24. By next spring the first 100 feet will be finished. The entire structure will be completed by the spring of 1906. Examination of the remains of the fallen tower proved that the bricks had been used for various purposes at a previous stage, in arches, fortifications, tops of walls, etc. The most important fact was that they were not Venetian, but Roman bricks. Moreover, when they were manufactured they were not manipulated like modern bricks, but formed from slices of clay; for they were found without the natural layers being disturbed. This process resulted in each individual brick being able to support a weight quite four times as great as the modern brick. It is pointed out that the new Campanile may be built to-day of bricks of the same origin. The bricks examined are of the first century. One bore the

impression of a horseshoe, proving the debated point that horseshoes were then in use.

#### THE KOREAN TWINS.

The appearance in this country of the Korean twins, as they are termed, has caused them to be the subject of considerable study among scientists who were familiar with the Siamese twins, who attracted such attention when first exhibited in the United States. Comparisons have also been drawn between the Koreans and the female twins upon whom the operation was performed in Paris a few years ago. The latter were also exhibited in the United States, but, as will be remembered, the health of one was so affected that it was deemed necessary to separate the natural band which held them together in order to save the life of the healthier child. The twin who was afflicted with consumption died after the operation, but according to the latest reports from France, the girl who lived has entirely recovered, and apparently is in excellent health. It may be added that she has been adopted by the French surgeon who officiated at the operation.

Physicians and others who have examined the Koreans are of the opinion that they bid fair to live much longer than the Siamese, as they are active and vigorous, and thus far have had no ailment of consequence. Liao-Toun-Chen and Liao-Sien-Ne-Chen, as will be noted by the accompanying photograph, have typical Oriental features and might be taken for Chinese, but they were born in Korea. They are a little over twelve years old and well developed for their age, having no notable physical imperfection except the



THE KOREAN TWINS.

band which connects them. As in the case of the girl twins, each has all of the usual organs, and it is the opinion of eminent surgeons that they could be separated if desired with little danger of fatality. Liao-Toun-Chen is slightly taller than his brother and somewhat better developed, being more muscular. An examination shows that his heart beats much more rapidly, while his respiratory capacity is somewhat greater than that of the other. The smaller twin is left-handed, although from his position he is obliged to use both hands to such an extent that he is practically ambidextrous. He is more susceptible to changes in temperature, and apparently feels pain more than his brother, but in appearance seems to be equally as healthy.

The Koreans apparently have much more freedom of motion than the other types referred to. They can stand nearly side by side, face each other squarely. The freedom with which they can move without injuring themselves allows them to be quite active, and their motions are so harmonious that they not only walk, but run, and play various games without difficulty. One feat which the Siamese were unable to do was that of facing each other, one twin resting his hands on the shoulders of the other. The Koreans can easily assume this attitude, owing to the elasticity of the band which unites them. It is of a membranous character, and measures about  $3\frac{1}{2}$  inches in diameter. When not stretched or pressed in any way, it is about  $8\frac{1}{2}$  inches in circumference. When the twins are moving in any way, the band swells and diminishes slightly, apparently being connected with the principal trunk muscles of the bodies.

The Koreans, who were brought to this country by the Barnum & Bailey Company, have shown quite remarkable intelligence. When they first came to the

United States with their father, they remained in Bridgeport, Conn., and were provided with an instructor, from whom they acquired the rudiments of the English language. Then they took up a number of the primary studies, and have advanced quite rapidly.

#### Brief Notes Concerning Patents.

We have all heard of the wonderful Chicago slaughtering houses, where, according to one story, a live pig is taken in at one end of a machine and turned out at the other in the form of sausages and collar studs, everything being used except the squeal. Now comes the news of another prodigious example of mechanical ingenuity. A Swedish inventor, it is said, has constructed a machine which takes herrings as they come from the net, sorts them into the four sizes required by the trade, scrapes off their scales, cuts off their heads, splits, cleans, and washes them inside and out. Twenty thousand herrings are thus turned out every hour. The story is probably to be taken with the proverbial grain of salt.

Sylvester Babcock, of Buffalo, who claims to have been responsible for the first twist-barrel rifle, is living in that city. He occupies an old hut in the rear of an ice house at No. 26 Metcalf Street. He is almost blind, and unable to do any work whatever. He still has the original plans and specifications on which the original patent was granted twenty-five years ago, and says that after the first gun was finished and submitted to the Ordnance Department of the government, he received \$5,000 with which to pursue his work in this direction, and this, he says, is all the money he received from the invention. He says, however, that the persons who were associated with him in the venture grew rich from his idea.

A bottle-blowing machine, which is said to be suitable for a very great variety of work, has been recently invented by M. J. Owens, the patent expert of the Toledo Glass Works at Toledo, Ohio. That gentleman has been a great many years experimenting in this direction, and is responsible for a lamp-chimney blowing machine which is said to have already revolutionized that line of work. A great deal of time and money have been expended in the direction of securing a bottle-blowing machine, and the nearest approach to the desired object has been the machine by which the wide mouth fruit jars have been made. While this has been very successful, a satisfactory bottle blower has not been made up to the present time. The design of Mr. Owens has been in practical operation for some time at the plant on Detroit Avenue near Monroe Street, Toledo, and has demonstrated its usefulness fully. A number of them are accordingly being made, and will be made use of at this same plant.

An ingenious kite for utilization in connection with life saving at sea, in case of shipwrecks, etc., has been devised by Comte Brossard de Corbigny, and is known as the *Cerf-Volant B. C.* The kite is of the familiar type, and it is claimed by the inventor and others who have examined and inspected the contrivance at the Paris office of the *Société Centrale de Sauvetage des Naufrages*, that it is more serviceable aboard ship than any other life-saving device. When a ship runs ashore the kite is released, and the wind blowing on shore carries it inland, and when it is over the desired spot, an ingenious maneuver brings the guide rope within reach of those on the shore, thus establishing communication between the wrecked ship and the land. A pocket in the kite contains a series of signals, and accommodation for a message from the shipwrecked crew, while a receiver and transmitter for the establishing of telephonic communication are also attached. The invention has been tried with satisfactory results at Toulon and Brest, and an effort is being made to secure its adoption by the various shipping companies throughout the world.

The members of the Canadian Cattle Guard Commission, which has already been referred to in these columns, is composed of Messrs F. I. Holt, C. E., and George Robertson, with headquarters at Ottawa. Efforts are being made to secure specimens of cattle guards of all kinds for these tests, but none will be considered unless it is sent to the commission in such a shape that it can be put to a practical trial. A section of a standard gage track has been laid at the Ottawa Fair Grounds, with the usual number of ties and fully ballasted. The passageway is 17 feet wide, and in this the guards to be tested are placed, closing the whole 17-foot space either with the guard or the side fences. A couple of herds of cattle are kept on hand for this purpose, and when it is desired to put one of the devices to trial, a bunch of cattle is turned in the building from one end, and at the other end is a tempting haystack, which the animals soon discover, but their passage to this is cut off by the guard. There are a number of conditions which contestants must observe, and it is announced that what is sought for most is a device which will turn the cattle back. Trap-like constructions which hold the animals will not be considered.