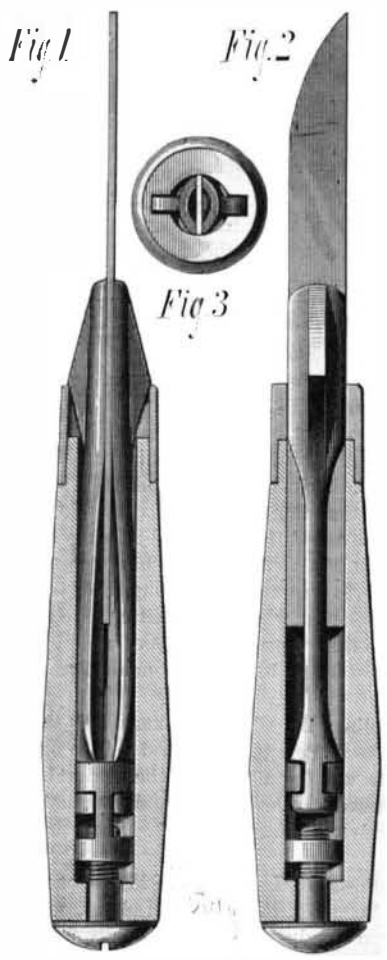
The Opium Traffic of Asia.

In a review of the British opium trade in India and China, Professor Christlieb, of Bonn, gives the following statistics showing the magnitude of the trade and its effects upon Indian agriculture:

Since the conclusion of the treaty of Tientsin, in 1860, the quantity of opium annually imported into China from the East Indies has increased to 80,000 chests. In 1875 as many as 85,454 chests, worth £10,000,000, were brought into the Chinese market, 8,943 of which were sent to Malacca, while the consumption of the drug for medicinal purposes in Great Britain in the same year reached only 165 chests. The progressive growth of the trade during the past eighty years is thus shown: In the year 1800, about 5,000 chests; in 1825, 12,000; in 1850, 50,000; and in 1875, 90,000. Among the most striking effects caused by the extension of poppy plantations in India are the diminution of the quantity of land available for other crops and the consequent curtailment of food products. In Benares and Behar, immense tracts of the finest and most fertile land in Northern and Central India have been gradually covered with poppy plantations. Quite recently 100,000 acres of the richest plains in Central India, and 55,000 acres in the Valley of the Ganges, which formerly used to produce corn, sugar, and indigo, have, to the impoverishment of the soil, been devoted to opium culture. The acreage devoted to that purpose to-day is estimated at 1,033,000 acres.

IMPROVED KNIFE HANDLE.

The annexed engraving shows an improved extension cutting blade handle, recently patented by Mr. Wilbur Webster, of East Jaffrey, N. H., Figs. 1 and 2 being longitudinal sections taken at right angles to each other, and Fig. 3 is an end view showing the shape of the jaws.



WEBSTER'S KNIFE HANDLE.

The invention consists of a handle containing two semi-tubular clamps, having their inner ends fitted to recesses in a movable block held by a screw in the end of the handle. The connection of clamps with the movable block is very simple and effective. The free ends of the clamps are provided with tapering projections that bear against the ferrule at the end of the handle as the clamps are drawn in by the action of the screw. The clamps are prevented from turning by slots cut in diametrically opposite sides of the ferrule for receiving the projections on the clamps.

This handle is adapted to a variety of tools, but it is more especially designed for flat cutting tools.

Further information may be obtained by addressing the inventor as above.

Statistics of Cotton.

According to the latest reports the great cotton spinning industry embraces throughout the world 71,250,000 spindles, of which 39,500,000 are in Great Britain. The United States have 10,050,000 spindles; France has 5,000,000; Germany, 4,800,000; Russia, 2,860,000; Switzerland, 1,870,000; Austria, 1,800,000; Spain, 1,775,000; Italy, 900,000; Belgium, 800,000; India, 1,275,000; Sweden and Norway, 310,000; Holland, 230,000; Greece, 36,000; and other countries (including Denmark and Portugal), 44,000 spindles. Britain has to every 1,000 of its inhabitants, 1,180 spindles; Switzerland, 675; United States, 218; France, 135; Germany, 108; Spain, 103; Holland, 57; Sweden and Norway, 48; Austria, 42; Russia, 30; Italy, 29.

SIMPLE TELEPHONE TRANSMITTER.

BY GEO. M. HOPKINS.

There are telephones and telephones, but in the host of instruments so named the successful ones may be counted

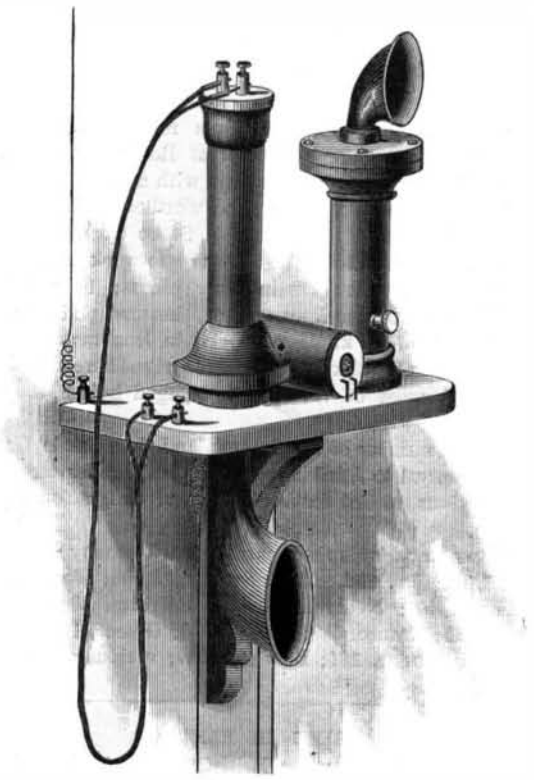


Fig. 1.—SIMPLE TELEPHONE.

upon the fingers of one hand. Of telephonic receivers it may as well be said there are but two, for there are only two principles involved in their construction. Of transmitters there are but two that have gained any notoriety and retained their foothold as useful instruments.

Having a chronic liking for telephonic research I have made it a point to try the various telephones as they have been made known to the public, and have found that with but few exceptions they are defective and useless as practical instruments, and interesting only at exceptional times when the conditions for experiment are favorable, and the adjustments delicately made.

In the course of these experiments the transmitter shown in the annexed engravings was devised, and it was subsequently developed into a usable instrument possessing all of the qualities requisite in a telephone. In the first place, it is so simple as to be capable of construction by the merest tyro, and never needs adjustment. It requires neither call bell, keys, nor switches when used in an ordinarily quiet place, with a closed local circuit.

Fig 1 is a perspective view, showing the relative arrangement of the transmitter and receiver; Fig. 2 represents the arrangement of the local circuit and line; and Fig, 3 is a vertical section of the transmitter.

The transmitter is fixed to the bracket and stands vertically, with its sound-collecting mouthpiece pointed in the direction whence the sound proceeds. The receiver, which is an ordinary Bell instrument, stands when not in use over a curved pendent resonator, the smaller end of which projects through the shelf of the bracket and just enters the hole in the center of the receiver mouthpiece.

Between the transmitter and the receiver there is a small induction coil, whose primary wire is connected with the local battery and the transmitter. One terminal of the secondary wire of the coil is connected with the receiving instrument and line, the other terminal is grounded. These connections will be understood by reference to Fig. 2. *a* and

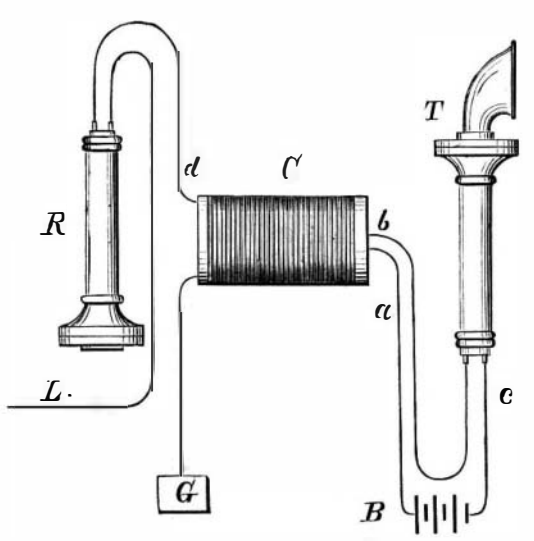


Fig. 2.—ARRANGEMENT OF TELEPHONE CIRCUIT.

b are the terminals of the primary wire of the induction coil, C. The terminal, *a*, connects with the battery, B; the terminal, *b*, runs to the transmitter, T, connected with the battery by the wire, *c*. One terminal of the secondary wire of the coil, C, is grounded; the other terminal, *d*, connects with one binding post of the receiver, R, the other binding post being in communication with the line wire, L. This arrangement is adapted to a closed circuit, one or two cells of gravity battery being connected with the transmitter. If an open circuit battery is used a switch is placed in one of the wires, *a*, *b*, *c*, so that the local circuit may be left open when the talking is done.

The construction of the transmitter will be seen in the vertical section, Fig. 3. The diaphragm, A, has attached to its center a small brass cup, B, containing a button of ordinary battery carbon three sixteenths of an inch in diameter and about the same thickness. This carbon projects beyond the brass cup, and is surrounded by a short paper tube, which projects beyond the face of the carbon one eighth inch. A piece of copper foil placed between the brass cup, B, and the diaphragm extends to the edge of the diaphragm, where it is pressed by a spring in the cell, C, which is in metallic contact with a wire extending downward through the lower end of the instrument.

The standard supporting the diaphragm cell is hollow, about five eighths inch internal diameter, and the height of the diaphragm above the bracket is four inches.

In the standard there is a bottle, D, of special form, supported by a ring, E, having a threaded stud extending through a slot in the standard, and provided with a milled thumb nut, by which it may be clamped at any desired height. The bottle, D, has a long narrow neck, about three sixteenths inch internal diameter, and a platinum wire blown in the lower end connects with the local circuit wire, which is coiled to admit of moving the bottle up or down. This wire extends through the base of the instrument, and is connected as shown in Fig. 2. The bottle, D, is partly filled with mercury, in which floats a pencil, F, of carbon of the kind used for electric lighting by incandescence. This pencil is one eighth inch in diameter, two and one eighth inches long, and is made slightly convex and very smooth at the

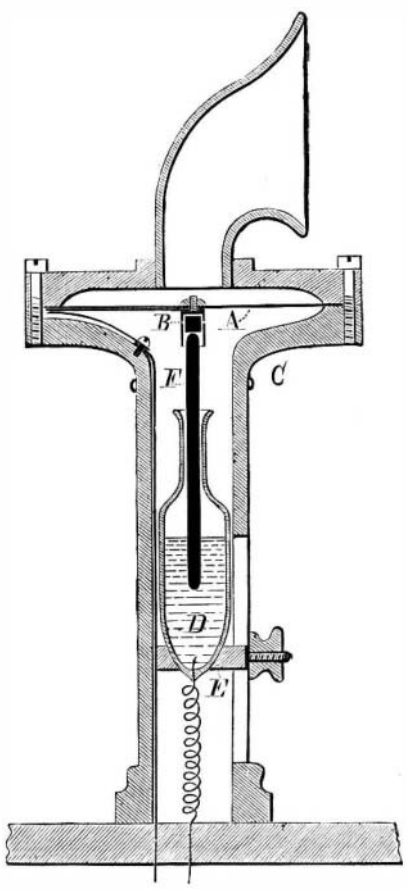


Fig. 3.—TELEPHONE TRANSMITTER.

ends. The mercury buoys the carbon up so that it is always kept in light and uniform contact with the carbon button, while it also forms part of the conductor in the local circuit. The carbon attached to the diaphragm is perfectly plane on its contact surface, and as smooth as it can be made by means of a fine file.

The diaphragm, which is of mica, has one and three-fourths inches free to vibrate. It is rather stiff, and is clamped firmly in its cell. The surfaces between which the diaphragm is clamped are perfectly true, and made of material not liable to warp. Wood well soaked in paraffine answers a good purpose, but vulcanite is far better.

The induction coil used with the instrument is of the ordinary form, two inches long, one inch in diameter, with a three-eighths inch core of No. 18 soft iron wires. The primary coil consists of three layers of No. 18 silk covered copper wire, and the secondary of No. 36 in sufficient quantity to fill the spool. One cell of Leclanche or Fuller battery will work the transmitter, but two will augment the volume of sound.

As to the efficiency of this instrument it will bear comparison with other transmitters, and in one or two points it seems to have an advantage. It will transmit speech clearly whether the speaker is within ten inches or as many feet of the instrument. Although a call bell may be used in connection with it, generally none will be required, as by saying o-o-o-o loudly in the mouthpiece a trumpet-like sound is heard in the receiver at the other end of the line, which, although not very loud, is sufficient to attract attention in a measurably quiet room.

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Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they will enable the observer to recognize the planets. M. M.

POSITIONS OF PLANETS FOR MAY, 1880.

Mercury.

On May 1 Mercury rises at 4h. 10m. A.M. On the 31st Mercury rises at 4h. 23m. A.M.

Mercury, Venus, and Saturn rise nearly at the same time on May 1, in the hour preceding sunrise, Venus being farthest north.

Mercury and Neptune will be in close proximity on the 18th, but they rise so nearly with the sun that Mercury is not likely to be seen.

Venus.

On May 1 Venus rises at 4h. 18m. A.M. On May 31 Venus rises at 3h. 57m. A.M.

Although Venus rises so nearly with the sun during May its brightness will make it conspicuous.

Saturn and Venus rise nearly at the same time on May 1. Saturn is south of Venus.

Mars.

Mars is the only planet to be seen in the evening sky of May.

On May 1 Mars rises at 8h. 35m. A.M., and sets at 11h. 47m. P.M.

On May 31 Mars rises at 8h. 6m. A.M., and sets at 10h. 52m. P.M.

On May 1 Mars is west of the star Delta Geminorum, at a declination 2° farther north; it passes this star on May 9 at a distance of 1½° north. On the 15th Mars has the right ascension of Castor, but is nearly 9° south of that star. The crescent moon may be seen to move toward Mars on the evening of the 13th.

Jupiter.

Jupiter will be brilliant in the early mornings of May.

On the 1st Jupiter rises at 3h. 41m. A.M.; on the 31st at 1h. 57m. A.M.

Jupiter may be seen south of the waning moon on the morning of May 5.

Saturn.

Saturn, Venus, and Mercury rise nearly at the same time on May 1, Saturn being about 1° south of Venus.

On May 31 Saturn rises at 2h. 31m. A.M., following Jupiter after about half an hour, and making its diurnal path 3½° north of Jupiter. The waning moon and Saturn have nearly the same right ascension on the morning of the 7th. Saturn is nearly 8° south of the moon.

Uranus.

Uranus rises on May 1 at 1h. 9m. P.M., and sets at 2h. 25m. A.M. of the next day.

On the 31st Uranus rises at 11h. 12m. A.M., and sets 27m. after midnight.

Uranus is still very near the star Rho Leonis. On May 31 it is half a degree east and half a degree north of this star, when on the meridian.

Sun Spots.

A large group of spots, inclosing three of more than ordinary size and some ten or twelve small ones surrounded by faculæ, was seen on the sun's disk on April 12. These spots passed out of sight by the motion of the sun on its axis between the 14th and 15th of April.

If this group reappears, as is probable, it will be well advanced upon the sun's disk early in May. A telescope of low power (with a colored glass) will enable an ordinary observer to watch the changes of these spots, as caused by the sun's turning, and also those variations which belong to the violent action on the sun's surface.

A Dangerous Amusement.

As out-door sports begin the girls are sure, this spring, to take their usual turn at rope jumping. Scarcely a season passes without several reports of girls dropping dead after some long continued effort, as in trying to skip the rope a thousand times; and even when not so carried to excess the practice is decidedly hazardous. Dr. Peck, of the Surgical Institute at Indianapolis, pronounces it a prime cause of cripples among girls. Speaking of a recent operation in which the bones of both legs of a little girl had been removed owing to necrosis caused by rope jumping, Dr. Peck says that similar cases are of frequent occurrence, though the mischief more commonly shows itself in necrosis of the spine. Not a month passes but cases are brought to the institute to be treated for injuries brought on by the continuous concussions upon the bones in this amusement. He advises parents and teachers to prohibit the "pernicious pastime" at all times and under all circumstances.

The New York International Exhibition of 1883.

The Senate bill (No. 1160) to provide for an International Exhibition in this city in 1883 was passed by the House of Representatives April 19. It had already been passed by the Senate, but having been slightly amended by the House it was returned to the Senate for the concurrence of that body. The chief amendment consisted in the addition of the names of the members of what is known as the Hilton committee to the original list of incorporators. The changes were concurred in by the Senate April 20. It is to be hoped that the differences between the rival committees will be promptly and amicably settled, and that nothing will occur to hinder the prosecution of the enterprise.

THE GREAT SOUTHERN COMET.

The event which is creating a considerable sensation in the southern hemisphere is the nightly appearance in the southwestern heavens, shortly after sunset, of a large and luminous body, supposed by those conversant with the aspects of such celestial visitants to be a comet of no ordinary kind. It is remarkable that astronomers throughout the British colonies and in England have not given the least intimation or prediction as to its coming.

The appearance of the present comet is what astronomers designate "a beam." Its continuance is uncertain, though it may remain visible for some time, especially as it has not yet attained its perihelion and the nucleus has not been seen, though, doubtless, it will be at the Cape, France, England, and other countries. In brilliancy and grandeur it is vastly inferior to the comet which appeared in the early days of the colony.

Our illustration represents the comet as it appears nightly; that it is wonderful and awe-inspiring, we admit, but the absence of superstition from our minds, and a belief in the opinions of scientific men as to the cause of such phenomena, has banished all dread as to the baneful results which are expected to follow its appearing. The most notable comets of modern times are those of 1843, 1847, 1853, 1858, and 1861. That of 1843 is still regarded as the most marvelous of the present age, having been observed in the day-time before being visible at night—passing very near the sun—exhibiting an enormous length of tail of a fiery character, and arousing interest in the public mind as deep as it was unprecedented. Whether the comet now visible to us has anything to do with the heat of the atmosphere we cannot say, but it is a fact that for days prior to its coming the temperature was higher than usual.—*Frearson's Weekly, Adelaide, Australia.*

WHAT IS THE TIME OF JUPITER'S ROTATION?

The great red, elliptical spot on the visible surface of Jupiter is so long that could the earth be placed at one

Jupiter seen through a 9 in. telescope.—Power 350.—7h. 49m., Oct. 20, 1879.

end of it and rolled it would make nearly a complete revolution before arriving at the opposite end; and so wide at the widest part that the earth would overreach it on either side by but little more than half the diameter of our moon, and stands in such contrast to the surrounding disk as to be visible with large telescopes when the planet is but three hours from the sun in right ascension, and the sun on the meridian.

The authorities, Sir William Herschel, Beer, Mädler, and others, give for the time of Jupiter's rotation 9h. 55m. 26″. The red spot was estimated central on the disk, October 3, 8h. 55′, 1879; on January 10, 5h. 40m., 1880, it was again estimated central, having in 98d. 20h. 45m. made 239 apparent revolutions about the axis of Jupiter—approximate real time of rotation, 9h. 55m. 37″+.

It has been suggested that this spot affords an excellent opportunity for determining the time of Jupiter's rotation; and the attention of amateurs has been called to this work by a note from abroad.

It is generally believed by scientists that no considerable portion of a planet's atmosphere is likely to move much faster in the direction of the planet's rotation than the planet beneath travels; that any considerable motion must be in a direction opposite to the planet's rotation.

If this red spot represents the time of Jupiter's diurnal rotation that planet presents to us the remarkable phenomenon of the whole equatorial atmosphere moving in the direction of the planet's rotation 6,500 miles farther in 24 hours than the surface of Jupiter beneath it travels in the same time.

Most of the cloud forms in the equatorial belt are far from permanent, either in location or outline; some of them change so much in a few days as to be unrecognizable; but a well defined light spot was observed about central on the disk of Jupiter, September 27, 1879, at 8h. 5m., which, after making nearly 356 revolutions about the planet's axis, was last seen, unchanged to any great extent, just coming on the disk, February 20, 1880, at 4h. 55m.—approximate real mean rate, 9h. 50m. +.

On September 28, 1879, it was noticed that the red spot and the markings on the equatorial belt were separating at a rate which would bring them again together in about 43 days. Since then it has been observed that when the red spot has made 105 to 109 revolutions about Jupiter's axis the equatorial belt will have made one more.

When Jupiter rises on the morning of May 22, 1880, the red spot will probably be on the disk, and that portion of the equatorial belt above mentioned north of the spot. At 4h. 10m., Washington mean time, it is estimated that the red spot will have passed the center of the disk, and the planet will be high enough for observation in the eastern part of the United States.

Accepting 9h. 50m. as the time of Jupiter's rotation, the spot is traveling rapidly westward. Suppose it to have an independent rotary movement, in the direction taken by the hands of a watch, which on the circumference is not less than 250 miles an hour, sometimes much more, and it will account for about all the observable phenomena in the region of the spot. H. G. FITZ.

Peconic, N. Y., April 7, 1880.

The Geodetic Union of Europe and Africa.

The important work of connecting the systems of triangulation covering Western Europe and Northern Africa was consummated in the latter part of October last. Preparations for it had been going on for several years under the direction of General Ibañez and M. Perrier, acting respectively for the governments of Spain and France.

Four mountain heights were selected for signaling operations, namely, Mulhacen and Tetica, in Spain (the former being the highest in that country), and Filhaoussen and M'Sabiha, between Oran and the frontier of Morocco. It was decided not to trust alone to solar signals, but also to employ the electric light at night, and the event fully justified this resolve, for the solar signals totally failed, being seen neither in Spain nor Algeria. The difficulties of the enterprise, then, will be obvious on consideration, for to produce the electric light with sufficient intensity it was necessary to have recourse to electro-magnetic apparatus driven by steam engines, and the problem was that of hauling up Gramme machines, engines of six horse power, and various instruments, to summits of 1,000 to 3,550 meters height, making roads on these desert mountains, organizing supplies of water and fuel, and finally providing accommodation and sustenance at each station for twenty to one hundred men and fifteen or twenty beasts. There was a military guard attached to each station (in Algeria especially this was necessary), and the soldiers worked in roadmaking, etc. The time open for operations was short between the intense heat and the early snows. On August 20 all were at their posts—Colonel Barraquer on Mulhacen, Major Lopez on Tetica, Captain Bassot on Filhaoussen, and M. Perrier on M'Sabiha. But in vain were solar signals sent by day and electric by night; the vapors from the Mediterranean proved impervious to the beams. At length, however, on September 9, after twenty days' feverish expectation, M. Perrier perceived the electric light of Tetica, visible sometimes to the naked eye, like a round reddish disk, as bright as Alpha in Arcturus, which appeared near the horizon. On the 10th he perceived the electric light of Mulhacen. The Spaniards also perceived the French signals, and a period of definite observation was entered upon, extending from September 9 to October 18. The geodetic junction of the two continents was at length realized. The numerical results arrived at with regard to those four immense triangles of some seventy leagues length of side are given in a communication by M. Perrier to the French Academy, and are shown to have satisfactory accuracy.

By this work the geodetic operations in the British

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