

business facilities of New York city, promotes rapid transit, and adds to the wealth and prosperity both of city and State. The legislature of New York should assist the work by promptly granting the most liberal facilities for establishing depots and necessary works on the New York side of the river. Congress has just passed the bill to facilitate the organization of a great International Exhibition, to be held in New York city in 1883. If the State legislature will now act promptly in granting the modest requirements of the tunnel company this great work of tunneling the Hudson will be completed before the exhibition opens and in time to bring millions of passengers from the North, South, and West directly into the limits of the city. The great railway tunnel under the Thames river, at London, 1,600 feet long, is justly regarded as one of the most remarkable engineering works ever undertaken. But this Hudson river tunnel, which will be over 5,000 feet long, puts the Thames work far into the shade. Mr. D. C. Has- kin, the originator and manager of the Hudson tunnel, is entitled to every aid which the citizens of New York can give him in the prosecution of this great undertaking. He deserves the highest honors for his sagacity and perseverance in pressing forward the enterprise, in the face of the most inveterate prejudices, carpings, adverse opinions, and criticisms of engineers, and even active opposition of most powerful opponents. It is plain that we have in Mr. Has- kin the right man at the head of the work.

Our various illustrations require but little explanation. On the front page we give views of the interior of the tunnel, showing the manner in which the iron shell is put in, the earth heading being cut in the form of stairs to facilitate the workmen in putting in and bolting the iron shell, no staying being required. The brick lining, and the mode of mixing the excavated silt with water and its discharge from the tunnel through the air pipe, are also shown. In addition to the engravings here given we publish in our SUPPLEMENT this week a number of additional engravings, showing the sectional view of the river, with tunnel built as proposed, with depths of water and distances; also a side sectional elevation of the tunnel works as far as they have advanced, showing the location of the air machinery, and all parts and appliances of the work; also plans and diagrams of the approaches; and a detailed description of the whole. We shall watch the progress of this great work with pleasure, and keep our readers supplied with all facts of interest thereto relating.

#### The Franco-Lorillard Expedition.

M. Charnay, in charge of the Franco-Lorillard Explorations in Mexico and Yucatan, sailed from this port for Mexico, April 21. On his arrival at the Mexican capital, M. Charnay will engage excavators and proceed at once to the places marked on the plateau of Anahuac during a previous visit, as likely to yield evidences of the extinct civilization he proposes to study. M. Charnay has already sent from France to Vera Cruz over four tons of implements and machines for use in his work of exploration, including two tons of elastic hemp paper, for moulding purposes, dredges for the sacred lakes of Yucatan, where he intends to search for the jewels cast into the water in idolatrous worship as offerings to the gods, ladders in sections with iron clamps, and photograph materials.

In stating his plans to a *Herald* reporter M. Charnay said: "I do not suppose that I shall reach Central Mexico for five or six months. From my own observations on the spot and from the statements of other writers, I take it that traces have already been discovered in the province of Yucatan of about forty ancient cities. Further, there are unmistakable indications that this district and these cities were more densely populated than is any known portion of the globe at the present moment. It is a puzzle as to how these people subsisted, as the district is rocky and barren in the extreme save for a prodigious growth of underwood or scrub, which presents a formidable obstacle to the rapid prosecution of excavations. During my recent explorations on behalf of the French Government in Java, I was much struck with the general resemblance existing between the traces of the ancient inhabitants of that country and those I found in Mexico. But a much higher degree of civilization is indicated as having existed in Java. We have at present in view a two years' sojourn in Mexico and Central America, but if necessary our stay may be protracted even another year."

#### Demand for Immigrant Labor.

The Secretary of the Board of Emigration reports that the labor bureau of Castle Garden is besieged with applicants for newly arrived help. The most of the applications for domestics are for German and Swedish girls. There is also a large number of applications from silk mills in Paterson, N. J., and in Connecticut, for factory girls and families. One firm wants thirty families with children old enough to work, and promises them good homes, steady work, and fair wages. The Russell Manufacturing Company, of Middletown, Conn., recently sent for thirteen families. Neither of these orders could be filled at once. There are many inquiries from firms in this city for girls to work at china decorating.

The demand for men is much greater than for women, principally for experienced iron workers, miners, brick-makers, and weavers, and the supply is inadequate. In one day 152 men and boys were sent to different parts of the country, and the day before 178 more were sent from the

Castle Garden labor bureau. Of these some were engaged to work in coal and iron mines in this State and Pennsylvania; several Germans were sent to Frary's cutlery works in East Bridgeport, Conn.; 40 Hungarians were sent to brick-yards in New Jersey; 20 Hungarians were forwarded to the brickyard at Northport, L. I., and a few farm laborers were sent to Connecticut. Applications are on file with Mr. Jackson from fifty different places for silk weavers, wrappers, and winders, cotton and woolen weavers, spinners, and card-room hands. One application was received for 200 carpenters to work on the new hotel at Rockaway Beach, the wages offered being \$2.25 a day, with an average of two days' overtime each week in good weather. Applications were received from the Columbia Stone Company, North Amherst, Ohio, for 20 or 30 Germans to work in the stone quarries; 100 stonecutters in other places; 10 moulders; machinists, pattern-makers, rollers, heaters, puddlers, and skilled hands of all kinds employed in iron manufactures. Not more than 300 silk weavers have arrived here since January 1, and most of them were engaged before they left home.

The total number of immigrants landed at Castle Garden from January 1 to April 20 was 56,404, a number surpassing any previous record in the history of emigration to this country.

Of the new arrivals there came from Germany 9,884; Ireland, 7,143; England, 4,537; Sweden, 3,003; Norway, 307; Denmark, 481; Netherlands, 565; Belgium, 304; Switzerland, 1,479; France, 508; Italy, 1,770; Greece, 138; Russia, 718; Luxemburg, 161; Bohemia, 300; various other countries, 193.

#### CRIME IN BENGAL.

The area of Bengal under British control is about that of Great Britain and Ireland, with about the same number of inhabitants. The population is made up principally of native Hindoos and the Mohammedan descendants of the ancient Mogul invaders.

In a lecture on what the English have done for the Indian people, delivered to the members of the Philosophical Institution, Edinburgh, Dr. W. W. Hunter, Director General of Statistics to the Government of India, said, according to the *London Times* report: "There was now only about one-third of the crime in Bengal that there was in England. While for each million persons in England and Wales there were 870 criminals always in jail, in Bengal, where the police was very completely organized, there were not 300 convicts in jail for each million; and while in England and Wales there were 340 women in jail for each million of the female population, in Bengal there were less than 20 women in jail for each million of the female population."

A well-paid and highly disciplined police, the doctor said, now deals efficiently with the small amount of crime in Bengal; a happy state of things attributable to British rule, if the British view of the case is to be accepted.

It would be interesting to know how many of the Bengal criminals are of European parentage; and why it is that British rule at home shows results so poor in comparison with India. Of course it would not do to suspect that those benighted pagans and Mohammedans are naturally inclined to lead more wholesome and honest lives than the masses of Great Britain. Christian civilization would stand aghast at such a thought. Perhaps the missionaries, who tell us so much about the land where every prospect pleases and only man is vile, may be able to make clear the puzzle.

#### The Milling Roller Suits.

On February 2, Judge Treat, in the United States Circuit Court, rendered a decision in the case of R. L. Downton vs. The Yaeger Milling Company, of St. Louis, for the alleged infringement of Mr. Downton's process patent No. 162,157. The case came up for hearing on January 10, and on the date given above the court dismissed the bill and gave judgment for the defendant. The points at issue in this case are too well known to need extended expatiation in this connection. Mr. Downton's patent claimed the process of removing the germ from middlings by passing the latter through rolls. An erroneous impression prevails that the claims put forward by Mr. Downton were broader than this, but such is not the case. The patent did not cover the use of rolls on wheat, bran, or purified middlings, but simply the extraction of the germ by means of rolls. The Yaeger Milling Company purchased a number of Wegmann's Porcelain Rolls of E. P. Allis & Co., of Milwaukee, and it was for the use of these that Mr. Downton brought suit, which has ended in the courts declaring that Mr. Downton's patent lacked novelty. Mr. Downton has appealed the case to the Supreme Court of the United States, and has given notice that he will bring suits in other circuits.

The *American Miller* says that this decision frees the Millers' National Association from paying the royalty agreed upon in the compromise made last spring by that body in its annual convention. By the terms of that agreement the members of the association were to pay the Downton Purifier Manufacturing Company a royalty for the rolls then used in members' mills of \$25 per set for the first three sets of rolls, \$15 per set for the second three, \$10 per set for the next four, and all over that number (ten sets), \$5 per set, the payment to be made when the validity of the patent should be sustained by a decision of a Circuit Court of the United States. For the time being, therefore, the roller litigation may be regarded as over, and millers using rolls can breathe easy for awhile.

#### NEW INVENTIONS.

A means for determining the action and effect of steam in the retorts when manufacturing water gas has been patented by Mr. Henry C. Bowen, of New York city. In the manufacture of water gas the method heretofore in general use is to charge a retort or generator with coal, then bring it to a state of incandescence by driving air through it, then to shut off the air and force steam through the incandescent mass of coal. At this high temperature the incandescent carbon decomposes the steam, forming carbonic acid and hydrogen, and the carbonic acid, as it passes farther through the mass, is itself decomposed or robbed of one equivalent of oxygen by the carbon to form carbonic oxide. The commingled carbonic oxide and hydrogen then constitute the base of the water gas, and pass out of the generator, to be subsequently carbureted by passage through a hydrocarbon, and then fixed to form a stable gas by being heated in a separate set of retorts. The object of this invention is to provide means for enabling the operator to detect at any time the passage of undecomposed steam along with the carbonic oxide and hydrogen.

A device for operating elevators, so constructed as to raise the cages of the elevators by the movement of a train of cars, and which is especially designed for operating passenger elevators at stations upon elevated and underground railways, has been patented by Mr. Nicholas Nolan, of New York City.

A simple and efficient apparatus for cooling liquids and freezing ice cream by means of chemicals, has been patented by Mr. William F. Clapp, of Alleman, N. C. The invention consists of an oscillating or rotary vessel provided with compartments for the cooling mixture and the liquids to be cooled, and a central chamber for the reception of the ice or other refrigerant and the vessel containing the cream.

Mr. John De Frain, of Philadelphia, Pa., has patented an improved vegetable cutter, which is so constructed that it may be adjusted to cut the vegetables into slices or strips of any desired thickness.

An improved sash supporter, which is simple in construction and operation, and which holds the sash in any desired position, has been patented by Mr. William W. Sweetland, of Edwardsburg, Mich. The invention consists of an articulated spring latch, through which a rod fastened to the upper part of the window frame passes, and against which the latch is pressed to hold the sash in position. The latch is operated by means of a lever worked by a cord.

#### The First Rolling Mill in America.

To the Editor of the *Scientific American*:

I wish to correct a statement in your issue (No. 7) regarding the first rolling mill in America.

Your correspondent is mistaken in stating that his father built the first rolling mill in this country. My great-grandfather, Isaac Pennock, established one in 1798. I have the ledger bearing that date now in my possession.

The mill was called the "Federal Slitting Mill," and was located in East Fallowfield Township, Chester county, on the Buck run. It was used for rolling sheet iron and strips, principally the latter, which were slit up into rods for nails, etc. All nails then were forged out of rods by hand on the anvil. There were no boiler plates made or needed in those days.

My grandfather, Dr. Charles Lukens, was the first maker of boiler plates in Pennsylvania, and it is to be presumed in America. He was for a time at the Federal Slitting Mill, but in 1816 moved to Coatesville, and operated another mill called "Brandywine Iron Works." There boiler iron was first rolled.

At the death of Dr. Lukens, in 1825, the business was carried on by his wife, Rebecca W. Lukens, who greatly increased it and conducted it successfully for a number of years. As a tribute to her memory the name of the works was, after her death, changed to "Lukens Rolling Mill."

This was the first of the several mills now in this town, and has been operated continuously in the family from 1816 to the present day. It is now used merely as a feeder to a large steam mill erected alongside.

There were no railroads in this country then, and all iron and fuel had to be teamed, most of it to and from Wilmington and Philadelphia, the former 26, the latter 39 miles distant; some, however, was teamed to Pittsburg (315 miles) and beyond.

The old Federal Slitting Mill has long since been abandoned for manufacturing iron. A paper mill is now erected on its site.

A. F. HUSTON.

Lukens Rolling Mill, 2d mo. 14th, 1880.

#### Wild Dogs in the West.

For several years a pack of wild dogs have been known in the Yellowstone Valley. They are described as resembling a cross between a wolf and a spaniel. A more savage pack of wolf dogs are now reported in the wilds of Northwestern Nebraska. It is said that about two years ago two bull-dogs joined a band of wolves near the head of the Birdwood, and have remained with them ever since. Within the past year a species of dog-wolf, supposed to be the offspring of the escaped bull-dogs, have been committing depredations in that section. They are said to possess the cunning of the wolf combined with the ferociousness and pluck of the bull-dog, and are consequently much more to be dreaded than the common prairie wolf, and are far more bold and savage. The *Deadwood Times* says that they are becoming numerous and quite troublesome.

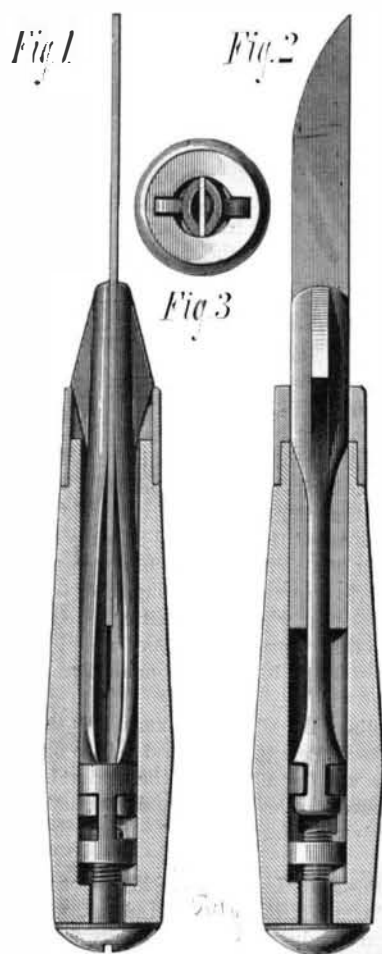
**The Opium Traffic of Asia.**

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.

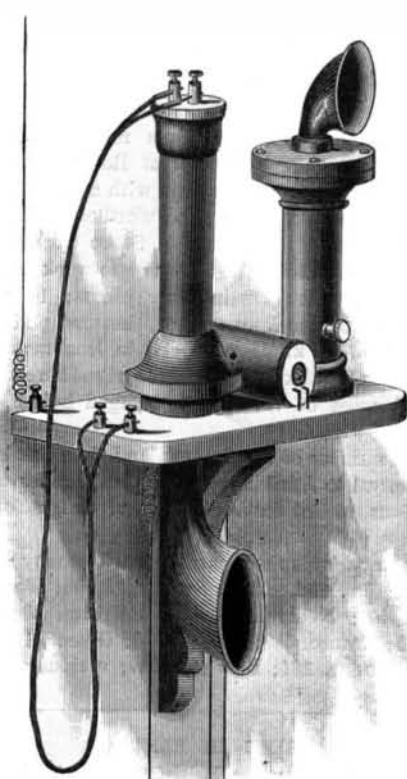
**Statistics of Cotton.**

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, 26,000; 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.

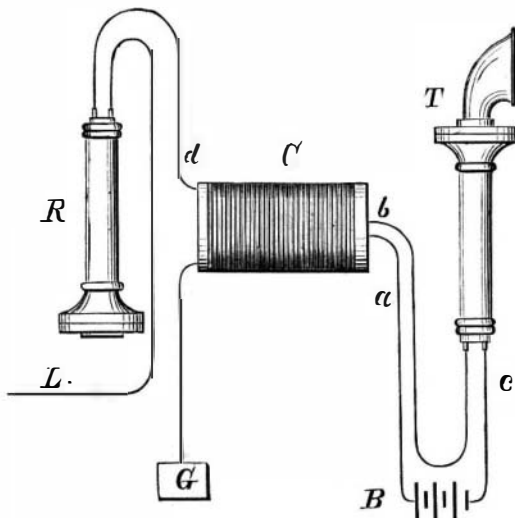
Having a chronic liking for telephonic research I have made it a point to try the various telephones as they have been made known to the public, and have found that with but few exceptions they are defective and useless as practical instruments, and interesting only at exceptional times when the conditions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

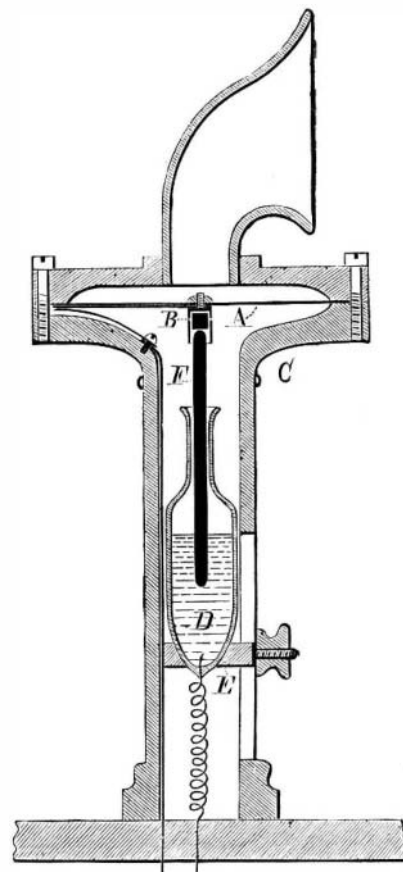
*b* are the terminals of the primary wire of the induction coil, *C*. The terminal, *a*, connects with the battery, *B*; the terminal, *b*, runs to the transmitter, *T*, connected with the battery by the wire, *c*. One terminal of the secondary wire of the coil, *C*, is grounded; the other terminal, *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 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.