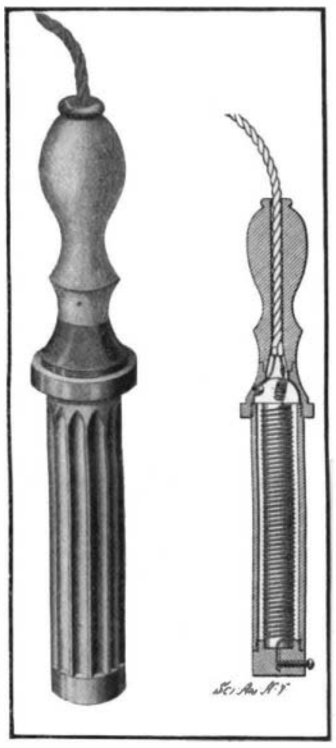
ELECTRIC HEATER.

It is often desirable to heat a small amount of water or other liquid in a hurry, and in buildings where electricity is used for lighting purposes this can be readily done by means of the device which is illustrated herewith. This device is the invention of Mr. Fernan O. Conill, of Havana, Cuba, Box 123.


ELECTRIC HEATER.

The inventor claims that with his little electric heater half a pint of water can be raised from freezing point to the boiling point in only four or five minutes. The heater may be cheaply made, as will be readily seen from the following description of its construction. The handle of the device, which is made of insulating material, is secured to a tube or cylinder of metal which surrounds a core of porcelain formed with a spiral groove to receive the resistance wire. The spiral coil of the core may be cut on an engine lathe by means of a diamond or quartz point. The resistance wire is a small platinum wire which, at its lower end, is secured by means of a set screw to the metal plug which closes the bottom of the cylinder. The other end of the heating wire is connected to one of the main wires or lamp cords which pass out through the handle. The other lamp cord is electrically connected to the cylinder. The latter may be fluted to increase its radiating surface. In use, the lower portion of the device is submerged beneath the surface of the liquid to be heated. The conducting cords are connected with the lamp socket or with the terminals of a source of electricity, whereupon the current in passing through the small platinum wire causes it to become intensely hot. The heat is then radiated to the cylinder, which in turn communicates it to the liquid. Practically no danger attends the use of the device, and it can be manipulated by any person of ordinary intelligence.

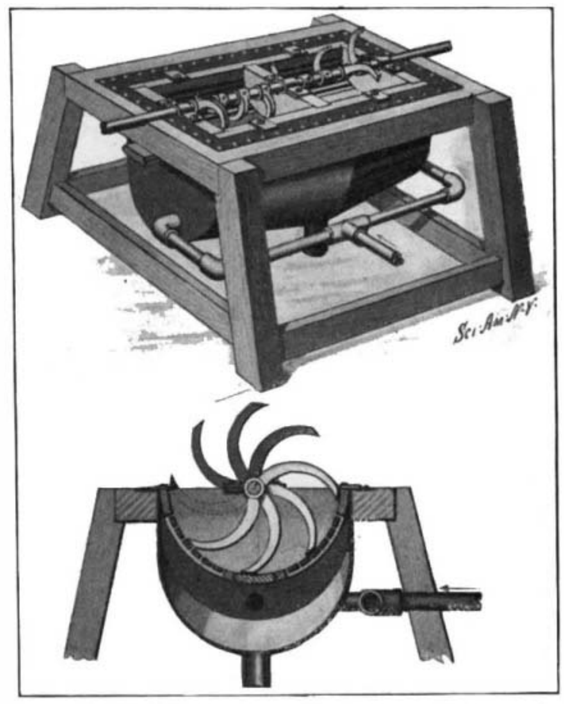
The Dynamic Flying Machine.

At a recent meeting of the Aeronautical Institute and Club, Herr Wilhelm Kress, of Vienna, read a paper on "The Dynamic Flying Machine." He stated that it would be necessary to overcome constructional difficulties before the dynamic flying machine was entirely successful. The greatest difficulties would be in the initial trials, and the man had yet to be born who could create a flying machine that would sail in the air at the first trial. He went on to say that much depended on material and conscientious workmanship, and expressed the conviction that the dynamic principle would overcome all difficulties, and that such a machine would sail through the air at a greater speed and with greater security than the motor-car of the day ran along the roads. The paper was illustrated by working models.

At a meeting of the Vienna Photographic Society, Eder exhibited a new light filter. The dye used is nitroso-dimethylaniline, which is of a yellow color and absorbs all the visible rays, but transmits the whole of the ultra-violet. By combining this dye with cobalt glass, a filter is produced that transmits the ultra-violet only. Some remarkable photographs of landscapes taken with these filters were also shown.

MACHINE FOR DRYING COCOA BEANS.

In the preparation of cocoa beans special conditions are met with which are not encountered in any similar process. Cocoa beans should never come into contact with metal while they are fresh, because they are very acid and such contact would turn them black at once. Furthermore, the beans must be kept in motion while fresh, otherwise they will stick together and form a solid mass. On the other hand, any stirring device that may be employed for agitating the beans during the drying process should be very carefully arranged, because the skins of the beans are very tender and easily injured. With these limiting conditions in mind, Mr. Leon G. Laprade, of San Jose, Costa Rica, has invented a drying machine which is calculated to dry the cocoa beans in a most efficient manner. It comprises a non-metallic receptacle in the form of a half-cylinder below which is a tank of similar form. The upper receptacle or basket is formed of longitudinally extending slats and is divided by a partition into two compartments. The bottom of each compartment is provided with a panel which may be withdrawn at will to empty the contents of the basket into the tank, whence they find an exit through a bottom outlet. The stirring device consists of a shaft mounted centrally over the baskets and provided with curved fingers in spiral arrangement thereon, so that, on rotating the shaft, when one finger is entering the basket, another will be leaving it, and more or less of the fingers will be in the baskets at all times, acting on the beans therein. The blades pass in close proximity to the bottom of the basket, and are triangular in cross section, the point of the triangle being on the inner side, so that they act as wedges to gently force the beans sidewise. A hot air supply is fed into the tank at each end, and this on rising through the slotted bottom of the basket takes up and carries off the moisture of the beans.


MACHINE FOR DRYING COCOA BEANS.

THE KAMM TYPEWRITER FOR USE WITH WIRELESS TELEGRAPHY.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

An ingenious new office printing typewriter for utilization with wireless telegraphy, or if necessary with wires, has been devised by Mr. Leo Kamm, a well-known electrical engineer of London, England. The apparatus consists in the main of a typewriter, which can be used for transmitting or receiving messages, and the general instruments associated for the dispatch or receipt of ether waves. The most important part of the installation, however, is the typewriter, or zerograph as it is called. This apparatus in general appearance is not widely dissimilar from the ordinary typewriting machine. It consists of a row of keys, which when depressed cause the typewriter so actuated to record the imprint upon paper in the usual way, and to transmit through the air two ether waves, which cause the distant receiving typewriter to record the same letters upon paper tape in much the same way as the Morse tape instrument.

Although similar in working to the ordinary typewriter, the principle and mechanism are widely different. The type keys are ranged in a quadrant in the orthodox style. In order to obtain the maximum number of signs with the minimum number of levers, only twenty-eight type keys are provided, twenty-six of which correspond to the letters of the alphabet. In addition there are two shift keys to change from letters to figures and signs or *vice versa*, these keys also serving for spacing purposes. The quadrant on which the types are placed moves up and down according to which shift key is depressed. Each key is connected with a lever, and at the opposite ends of these levers are fixed vertical rods, the upper ends of which are ranged in another quadrant. When a letter type key is pressed down, the vertical rod is forced upward, and at the same time the synchronizing arm is set in motion, and the first impulse is sent to line. This arm, which is the most vital part of the apparatus, and travels in a horizontal plane, is operated from the axis of the circle, corresponding to the quadrant, and travels round the circular path until its progress is arrested by impact with the projecting vertical rod of the depressed type key. The corresponding letter is then printed, a second impulse is sent to line, and the synchronizing arm is then returned to its original or zero position by an electromagnet.

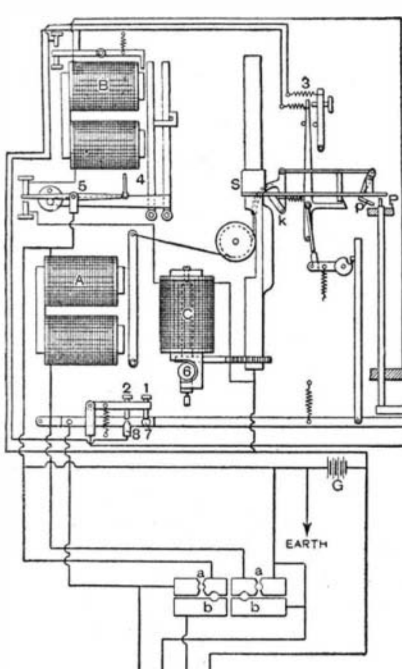


Fig. 1.—Diagram of the Working Parts of the Typewriter.

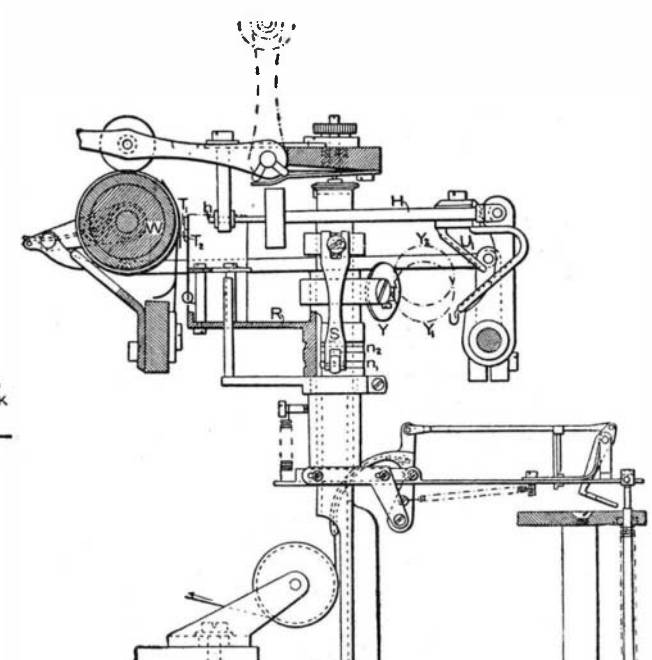
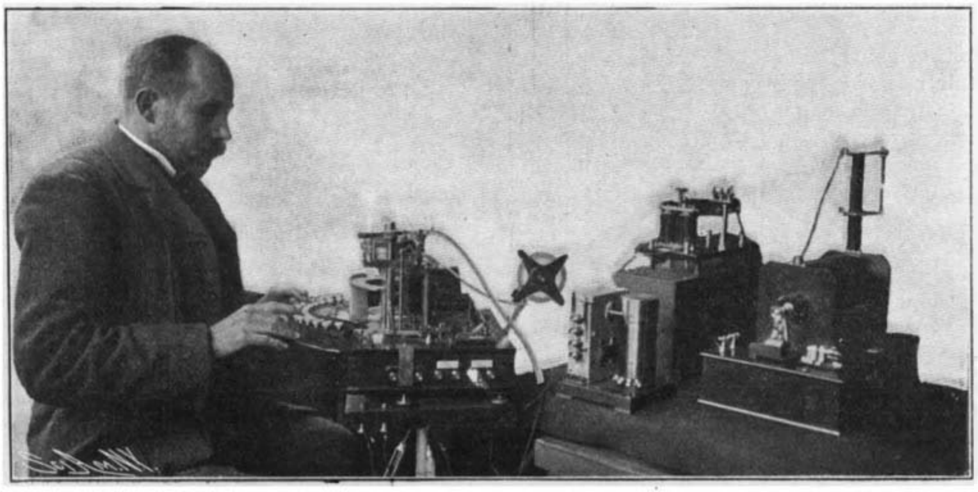


Fig. 2.—Part Elevation Illustrating in Detail the Synchronizing Arm, Type Quadrant Attachment, Printing Hammer, and Upper End of a Contact Pin.


A WIRELESS TELEGRAPHIC TYPEWRITER.

In order to comprehend the *modus operandi* of the apparatus, which is somewhat intricate, it is necessary to refer to the diagrams, of which Fig. 1 is a diagrammatic view of the working parts of the zerograph, and Fig. 2 is a part elevation illustrating in detail the synchronizing arm the attachment of the type quadrant, the printing hammer, and the upper end of a contact pin. The figures on the diagram, it may be explained, are applicable to either the transmitting or receiving zerograph, as each machine fulfills either function as required.

When the type key K is depressed, the vertical rod at its opposite end, which terminates in its upper end in a contact pin, P, is raised. The synchronizing arm or balance S has its zero position at the extreme end of the quadrant, and if set in motion without the depression of a type key, would swing in a horizontal circular path to the opposite extreme end of the quadrant. But the depression of the type key and the corresponding rise of the contact pin offer an obstacle to its progress. The stud 7 on the rocking lever beneath the key is caused to leave the receiving contact 1, thus enabling the contacts 2 and 8 to come together. Simultaneously there is another contact at 3, and a current is sent to line from the battery G. If there is no relay being used, plugs are inserted at $a\,a$, and the current received passes through the releasing magnet, A. This current, as it is received at the receiving zerograph, attracts this armature, thereby pulling back the little catch k on the synchronizing arm. By this arrangement, as the arm on the transmitting instrument is set in action by the depression of the type key, the similar arm on the receiving instrument moves simultaneously along its path. When the arm on the sending instrument comes in contact with the raised pin, the current is passed through the printing magnet B to the battery G. On the printing magnet B is a light armature, and this is now attracted, sending a second impulse to the line, which is received by the magnet A on the receiving instrument. This magnet again pulls the cord on the balance, and a small plunger p is caused to protrude against the nearest pin. This action closes the local circuit of the printing magnet in exactly the same manner as it is closed in the transmitting instrument. Across the printing magnet is bridged a condenser to diminish the sparking. A hammer is set in motion by the armature 4 of the printing magnet, and strikes the type against the paper tape, thereby leaving the impression of the letter. Simultaneously with the movement of the armature 4 the rocking arm 5 is tilted over. This breaks the circuit of the printing magnet, and closes the circuit of another magnet C. This latter is a strong magnet, and is called the zero magnet, as it returns the synchronizing arm to the zero position.

Fig. 2 illustrates the detail of the synchronizing arm, the attachment of the type quadrant, the printing hammer, and the upper end of one of the contact pins. When the shift key is depressed the quadrant carrying the type keys is moved up. The types are mounted on springs, each spring having two types, T_1 and T_2, placed one above the other. To the printing hammer, H, is fixed a small piece of metal, 1-16 inch thick, $U\,U_1$ the ends of which are grooved, as shown by the dotted line in the diagram. When the printing magnet is excited, the end of the hammer moves forward, and strikes one of the types against the tape and ink ribbon on the wheel W. When the shift key is depressed, a pin is raised which arrests the synchronizing arm when the flat wheel Y is in the position Y_1—that is to say, in the same plane as the end U of the piece $U\,U_1$. As the synchronizing arm travels forward, it raises the wheel Y and the whole carriage R upon which is fixed the type quadrant Q. The latter is lifted by exactly the difference in height between the two types T_1 and T_2, so that the type T_2 comes into action and records upon the paper. A light spring S, resting in one of the grooves n_1 or n_2, retains the carrier in its upper or lower positions. When the second shifting key is actuated, the synchronizing arm is stopped in a position in which the wheel Y is at Y_2, in the same plane as the end U_1 of the piece $U\,U_1$, this end being bent round by the angle equal to that between the two contact pins. The part U_1 on the stroke of the printing hammer is pressed against the upper end of the wheel Y and forces the type carriage down.

As the synchronizing arm has to return to zero after the completion of each letter is transmitted, it will be realized that a little longer time must elapse between each impulse when some type keys are depressed than with others. For instance, when the key at the extreme left of the type lever quadrant is depressed, the synchronizing arm has only about an inch to travel to transmit the impulse before it is stopped by the contact pin; but when the letter Z at the extreme right of the keyboard is pressed down, the arm has to travel the whole distance of the quadrant before sending the impulse. Still, a speed of nearly thirty words a minute can be maintained with but little practice on the part of the operator. An important feature of the instrument is that confusion of the letters cannot possibly result through the too rapid manipulation of the keys, since until the synchronizing arm has returned to zero after the depression of one key, another key will not operate. Should two keys be accidentally struck at the same time, only one key records its type upon the paper.

To apply the zerograph to wireless telegraphy, it is only necessary to connect it to the usual apparatus utilized for that work, the typewriter being substituted for the Morse transmitter. To insure satisfactory and successful operation, however, the inventor, Mr. Kamm, has devised several contrivances, such as an automatic coherer to enable rapidity in transmission and receiving to be attained, a new and special relay, and other important connections.

The machine is most favorably adapted to ether communication, owing to only two impulses being necessary for transmitting or receiving any sign. As each of these impulses corresponds to a dot on the Morse instrument, it is much easier to manipulate, and furthermore no apprehension need be entertained of a mistake arising through a dash being misconstrued into a dot, which is a feature of the Morse system of transmission and receiving, as there is always great difficulty in reading a dash correctly. The speed of operating the zerograph under wireless conditions is also immune from the many disadvantageous influences characteristic of the Morse system, being purely dependent upon the skill of the operator. By means of the zerograph it is possible to transmit at a speed of about twenty words per minute. Another important feature of the system is that it is free from tapping, or if not absolutely secure from outside influences, it is at any rate perfectly secret. If the impulses from one instrument are intercepted during their transit through the ether, the intercepter would be completely mystified, owing to each impulse being practically resolved into a dot, so that only an incomprehensible collection of dots would be received, and these would be of no value to the tapper at all. Furthermore, the nature of the apparatus admits of great differences in synchronism, so that only those instruments which are synchronized to one another will receive messages correctly.

For ordinary telegraphic purposes the zerograph is always ready for sending or receiving, but when used for wireless telegraphy two switches are provided. On the instrument is a small handle, and on the coil is another switch, which make the necessary connections for sending or receiving.

The coherer is of special design, and is absolutely different from any other type of coherer at present in vogue. Its principles of construction and working are preserved a secret, but its most salient characteristics are its extreme sensitiveness, being affected by the faintest ether wave, and automatic or quick self-decoherence, dispensing with the assistance of a tapper back. It decoheres instantaneously, thereby enabling more rapid communication to be established.

In the utilization of the apparatus for wireless telegraphy, when the type key is depressed, instead of the impulse being sent to line, it is passed round an electromagnet, which actuates the key closing the primary circuit of the induction coil and making the spark. The coil is exceptionally powerful, a 15-inch spark being obtained, which is ample to meet all demands. The relay is also of great power, and will overcome an exceedingly large resistance.

The zerograph has not yet been submitted to any tests over long distances with wireless telegraphy, but other experiments have been carried out with it over short distances under conditions so difficult that the trials corresponded to long-distance working under normal conditions. The German government has tested several of the instruments in the telegraph service for use with ordinary land lines, and they have proved eminently successful. They have also been operated in connection with the metallic current line between Brussels, Antwerp, and Ostend, and between Paris and Rouen. The latter line is particularly difficult in character, consisting of 100 miles of phosphor bronze, a similar distance of iron, and the remaining distance subterranean cable. It has also been tested between Paris and Brussels over a telephone line, simultaneously with a conversation being carried on, thereby proving its value for international purposes. No difficulty has been experienced in these operations, and the instruments have proved to be free from failure or breakdown.

THE LATEST BATTLESHIPS FOR THE UNITED STATES NAVY.

The designs for the "Louisiana" class of battleships were found to be so satisfactory that they were adopted for the latest battleships authorized this year by Congress. Very few alterations, and these quite of a minor character, were made in the original plans. The new ships will have a displacement of about 16,000 tons when they are fully equipped ready for sea with all stores on board, and are carrying their normal coal supply. Their principal dimensions are length over all 450 feet, breadth 76 feet 8 inches, and mean draft 24 feet 6 inches. They will be driven by twin-screw, vertical, triple-expansion engines, at a speed of 18 knots an hour, the estimated indicated horse power for this speed being 16,500. Steam will be supplied by batteries of Babcock & Wilcox boilers. The normal coal supply will be 900 tons, and the bunker capacity, estimated on a basis of 43 cubic feet per ton, will be 2,200 tons. The defensive arrangements of the new ships have been worked out after a careful comparison with our own and foreign ships, and are about the most complete to be found in any design, built or building in the world to-day. In the first place, there is an unbroken belt of Krupp armor from stem to stern, which is 11 inches in thickness at the waterline amidships and tapers gradually to a minimum thickness of 4 inches at the ends. Associated with this is a complete steel deck, 3 inches in thickness, which slopes toward the sides of the vessel to a junction with the side armor below the waterline. It is also sloped forward and aft to a junction below the waterline with the stem and stern. Upon this deck forward and aft, and extending above the main deck, are erected two barbettes of 12-inch Krupp steel; while above the main belt of side armor, and extending along the sides of the vessel for the full distance between the barbettes, and for the full height from the main belt to the upper deck, or main, is a continuous wall of 7-inch Krupp armor. The ends of this armor turn in across the vessel to a junction with the 12-inch barbettes. Within the armored citadel thus formed there are mounted four 40-caliber, 12-inch, high-velocity guns, and eight 8-inch 45-caliber high-velocity, rapid-fire guns, all twelve of these guns being protected within barbettes and turrets of Krupp steel, the 12-inch gun turrets being 10 inches in thickness, and the 8-inch turrets 6 inches in thickness. These twelve guns all have large arcs of fire above the main or upper deck. On the gun deck below, and firing through casemates in the wall of 7-inch armor just mentioned, are twelve 7-inch rapid-fire guns, arranged six on each broadside. There are also about a score of the very handy 3-inch rapid-fire guns scattered throughout the ship, six of them being carried on the gun deck, two forward and four aft, and three on either broadside on the main deck between the turrets of the 8-inch guns; the other 3-inch guns are carried on the bridges and superstructure. In addition to these there are twelve 3-pounders, semi-automatics, eight 1-pounder automatics, and two 3-inch field guns.

It goes without saying that this is a tremendous battery. All the guns are the latest high-velocity, long-caliber, rapid-fire type. The 12-inch has a muzzle velocity of 2,800 foot-seconds, an energy of 46,246 foot-tons, and a penetration of iron at the muzzle of 47.2 inches. The 8-inch gun has also a velocity of 2,800 foot-seconds, and its energy at the muzzle is 13,600 foot-tons, while it is capable of penetrating 31.4 inches of iron at the muzzle. The 7-inch gun is 50 calibers in length, has a velocity of 2,900 feet per second, a muzzle energy of 9,646 foot-tons, and can penetrate 28.7 inches of iron at the muzzle. The excellent 3-inch gun has the high velocity of 3,000 feet per second and a muzzle energy of 874 foot-tons.

In addition to the belt of Krupp steel that protects the waterline, nearly 8,000 cubic feet of corn-pith cellulose will be driven in back of the belt armor throughout the length of the ship, the mass being tightly rammed into a steel cofferdam, which is worked in as part of the structure of the ship. Should a penetration of the belt occur, the shot would probably pass through the corn-pith cofferdam; but as soon as the water followed, the saturation of the corn-pith would cause it to swell with great rapidity, until it acted with an obturating effect in closing the hole. Before the shell could reach the engine room or boilers, or magazines, it would have to pass through several feet of coal stored in the coal bunkers, and then it would have to effect a very oblique penetration through the sloping sides of the 3-inch deck. If it should penetrate the 3-inch steel deck, several feet more of coal would be encountered, and it is pretty safe to say that such fragments of the shell as might reach the vitals of the ship would have lost so much of their velocity as to be capable of doing very little harm when they got there.

One of the greatest improvements that has been made in the modern battleships, as compared with such old vessels as the "Oregon" and "Massachusetts," is the great increase in the freeboard, the upper or main deck of our latest battleships being from 8 to 10 feet loftier than that of the early battleships. This change is twofold in its advantages. In the first place, it provides very liberal berthing space and living accommodations for the officers and crew, and in the second place the command (height above sea level) of the guns is proportionately increased, and the vessels are much more comfortable in a seaway. The water, which is shown in our front page engraving as flying over the bows and across the turrets of the battleship, is simply surface spray; and it will be only in the very heaviest weather that green seas will be shipped. It will be a very rare case, indeed, when our latest battleships will be unable to cast loose their guns for action.

A New Star.

A telegram has been received at the Harvard College Observatory from Prof. Kreutz at Kiel Observatory, stating that a new star was discovered by Prof. Wolf, at Heidelberg, Germany, September 21.4388d. Gr. M. T. in R. A. 20h. 14m. 57s. and Dec. +37 deg. 9 min. 49 sec.