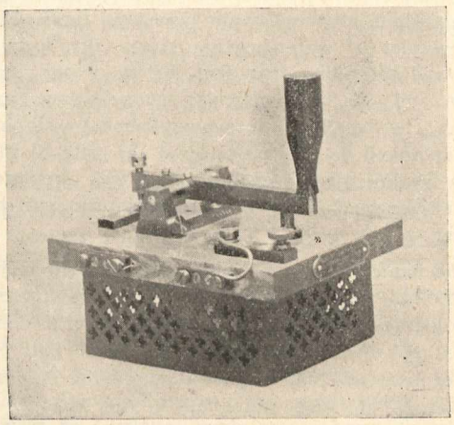
key has had to be considerably modified. The accompanying photograph shows a morse-key so modified and capable of interrupting a current of 50 amperes without damage to itself. The platinum contacts are much larger in size and the key is fitted with a magnetic blow-out, which quickly extinguishes the spark and so prevents damage to the key.



The Modified Morse Key.

THE LEYDEN JAR CAPACITIES.

To obtain at the same time the highest resistance and the maximum capacity in the lowest possible space, the tube form of jar has been chosen. The tubes are made of the best glass about 25 mm. in diameter and 2½ to 3 mm. thick, and their capacities vary from 0,0004 to 0,0005 M.F. each. Spare tubes are furnished with each set of apparatus, if for any cause one or more of the tubes have to be replaced.

TRANSFORMER-SENDING-STATION

The primary of the transformer consists of a few turns of thick, insulated copper wire and possesses such a self-induction that, together with the capacity described above, the desired period of oscillation $T = 2 P \sqrt{LC}$ is obtained. The secondary coil is of such a length, size and inductance that together with the aerial wire to be employed we obtain the highest possible resonance. As very high tensions are used (although quite harmless on account of the high frequency),

Wehnelt Electrolytic Interrupter.

the transformers are enclosed in a glass cylinder containing insulating oil. When the maximum resonance is obtained, this transformer is a powerful multiplier (Tesla effect), and produces a high tension which gradually increases to the extremity of the aerial wire where it is a maximum (Ferranti effect). The opening wire, which is necessary in order to restore symmetry, is conveniently replaced by a capacity which usually takes the form of concentric cylinders.

A switch is arranged to connect alternatively the aerial wire with the transmitting or the receiving system.

THE RECEIVING SYSTEM.

As such high tensions do not occur in the receiver, the condenser can have much smaller dimensions than those of the sending system. The coherer consists essentially of an ebonite tube containing hardened steel particles of a uniform size, in the adjustable space between two polished steel electrodes. It is not known whether a vacuum adds to the reliability of a coherer or not. At any rate it is certain that once an evacuated coherer loses its sensitiveness, it is of no further value. Our coherer can be restored to its original condition at any time by the renewal of the steel particles.

The magnetic adjustment.—It is well known that the coherer becomes magnetic in use, and that, while a small amount of magnetism increases its sensitiveness, too much renders it over-sensitive, and hence unreliable. To obtain the advantage of a small amount of magnetism and obviate the disadvantage of too much, a permanent ring magnet is employed.

The Microphone.—The foregoing apparatus is employed exclusively with the Morse register. In cases where a record is not wanted, where syntonizing is not essential, and for extreme distances, a microphone with telephonic reception is employed. The microphone consists of a steel disc pressed against a carbon or steel point. By means of a screw, the pressure of the disc on the point and hence the sensitiveness of the microphone-hearer can be varied at will.

From the accompanying photograph, the connections of microphone telephone and the dry cell, can be readily followed.

Science and Invention.

Two balloonists recently covered 807 miles in thirty hours, starting from Paris and landing beyond Budapest.

Six employees of a Barrow, Eng., engineering firm have received prizes, ranging from $5 to $50, for suggestions tending to the more economical production of work.

France has a standing offer of $12,500 for the invention of a satisfactory substitute for phosphorus. The German Government is stated to have such a substitute, and to have offered it to match factories which now use phosphorus.

To keep machinery from rusting dissolve one ounce camphor in one pound melted lard; remove the scum; mix as much black lead with the lard and camphor as will give it an iron color; clean the machinery well; smear with the mixture; after twenty-four hours rub off; clean and polish with soft cloth.

In putting on belting, it should be stretched as tightly as possible, and with wide belts this can be done by the use of clamps secured firmly to each end of the belt, and drawn together by clamp rods running parallel. There is no danger of breaking, as a belt six inches wide and three-ply thick will stand a direct strain of 5,000 pounds.

In Germany, electricity, among other curious results, has rehabilitated the discarded windmill. At Nersham, a windmill supplies power for thirty-six incandescent lamps, that light a large paint factory. Another keeps up a steady current of thirty volts. At Dusseldorf a windmill winds up a heavy weight, the descent of which works a powerful dynamo.

The heating of buildings by exhaust steam does not appear to be so economical as is generally supposed. Its economical use is limited by the amount of back pressure put upon the engine. An engine developed 300 horse-power from 80-lb. boiler pressure, or about 35-lb. mean effective pressure at one-fourth cut-off, there being 8-lb. back pressure caused by the heating system.

It is well known that aluminum works badly with certain cutting tools and files, and that an alloy of aluminum and magnesium have a marked superiority over pure aluminum, but less malleable and ductile. It has been observed that if aluminum is allied to 2 to 10 per cent. of magnesium, the metal obtained is hardly to be distinguished from aluminum, but when passed several times through a flatting mill, heated each time towards 400—500 degrees C., its principles are modified. The alloy cuts and files well, as though it was charged with magnesium. It has preserved, also, the ductility and malleability of pure aluminum.