

The final scene represents the shores of the Mediterranean adorned with cities and villas—the age of civilization in all its splendor.

Perhaps the most beautiful and really marvelous features of these scenes are the light effects produced by a most ingenious and novel system of electric illumination, and exceeding anything of the kind that has ever been exhibited on an American stage. Under the ingenious, skillful, and scientific management of Mr. J. C. Mayrhofer, the electrician, improvements are introduced almost nightly in these effects. His hand seems to have learned the cunning of nature while manipulating the colors of Iris.

It is intended that next season, in addition to the "Trip to the Moon" and "From Chaos to Man," at least one entertainment shall be presented which will be illustrated by scenes painted by American artists, from American originals, and owing whatever excellence it may possess as a revelation of the educational capacity of the stage to American science alone.

THE CHRONOGRAPH.

The apparatus which we are going to describe was constructed for the purpose of measuring the initial speed of projectiles.

The chronograph of Mr. Schmidt, which is capable of measuring as minute a period of time as the ten-thousandth part of a second, is based on this principle: The regularity and rapidity of the movement of the balance wheel of the escapement enables measurement to be made of intervals of time much less than that of one oscillation.

A special mechanism gives a constant range of 360° to that wheel to which is connected an index which marks thousandths or ten-thousandths of a second. The pointer is turned to zero. The spiral spring is then turned around half way, and the balance wheel when at rest is in the same position as the free balance wheel at the end of an oscillation. It is started and stopped by means of an electric current, which is broken at the moment of taking the observation and which is set in motion again when it is finished. The number of divisions compassed by the index during this interval gives the duration of the flight of the projectile.

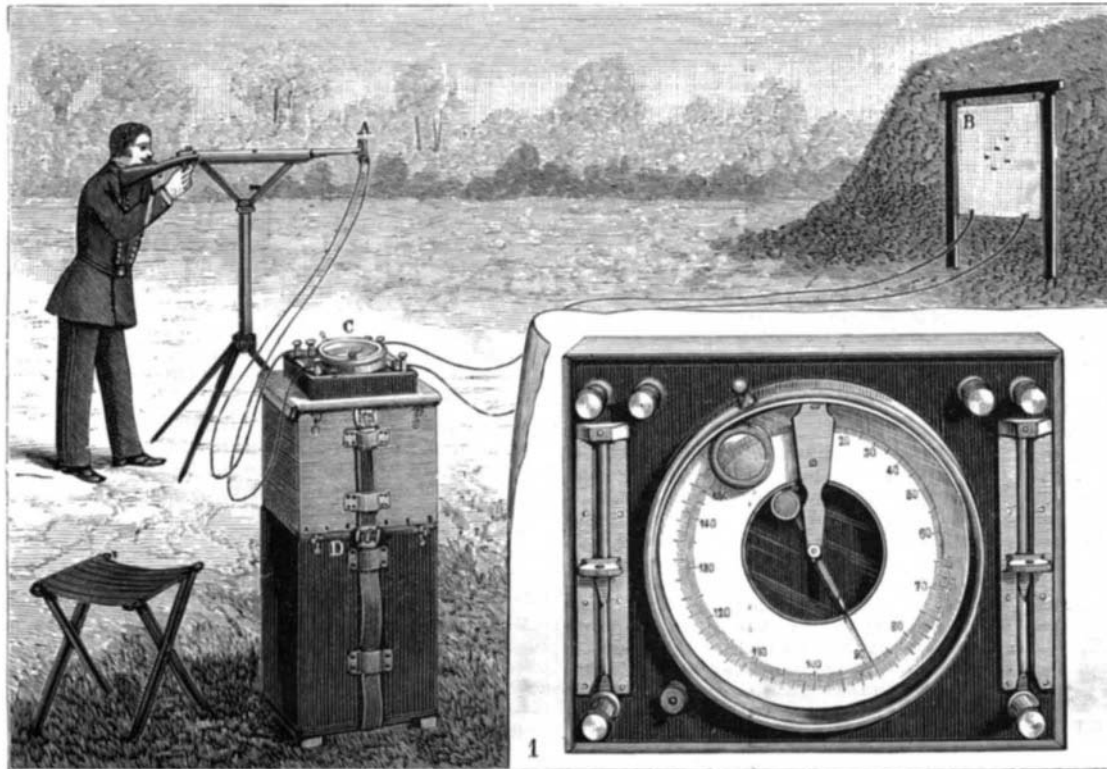
The balance wheel for measuring the intervals less than an oscillation is independent of the spring and of the escapement. The index pointer is turned by means of a thumb screw, designed for that purpose, to the zero point. The balance wheel is made of soft iron, and is held set by means of an electromagnet through which a current is passed of any desired intensity. These magnets become inactive and release the balance wheel at the beginning of the experiment, and do not stop the wheel until the end of the trial. This construction prevents the loss of time in starting and stopping which is so often found in apparatus of this kind.

These chronographs have been used principally for measuring the initial speed of projectiles. At the moment of discharge the projectile breaks the current by cutting a wire which is stretched in a primary frame attached to the end of the gun. The chro-

nograph continues to operate until the projectile passes through a secondary frame located in front of the target and which finishes the experiment. The graduation of the index into thousandths and ten-thousandths of a second is facilitated by the use of a break

The rheostats for regulating the current are located on both sides. The first connects with the frame located on the gun; when the discharge takes place, the projectile breaks the current at it, and the chronograph operates until the projectile passes the second screen in front of the target. It is possible, therefore, to read the exact interval that has elapsed while the projectile has passed between the two screens. If the distance is fifty meters, the device will indicate the number of meters traversed each second. The graduations on the index are very perfect and make an exact record of the making and breaking of the current.

The chronograph is very easily managed. The two currents are first regulated by the rheostats; the pointer is put back to zero by means of a thumb screw, and when this is done the chronograph is ready for operation. The chronograph Schmidt seems to possess certain advantages over the apparatus now in general use. It is portable and requires no solid foundation. It can be placed near the gun without being injuriously affected by the discharge thereof. It requires no special knowledge on the part of the operator. The index needle operates with the greatest precision. The indicator can be easily read, especially with the aid of a magnifying glass mounted on the apparatus. The results of experiments made at various time stations compare very favorably with the results obtained by other apparatus.—*La Nature*.



APPARATUS FOR MEASURING THE VELOCITY OF PROJECTILES.

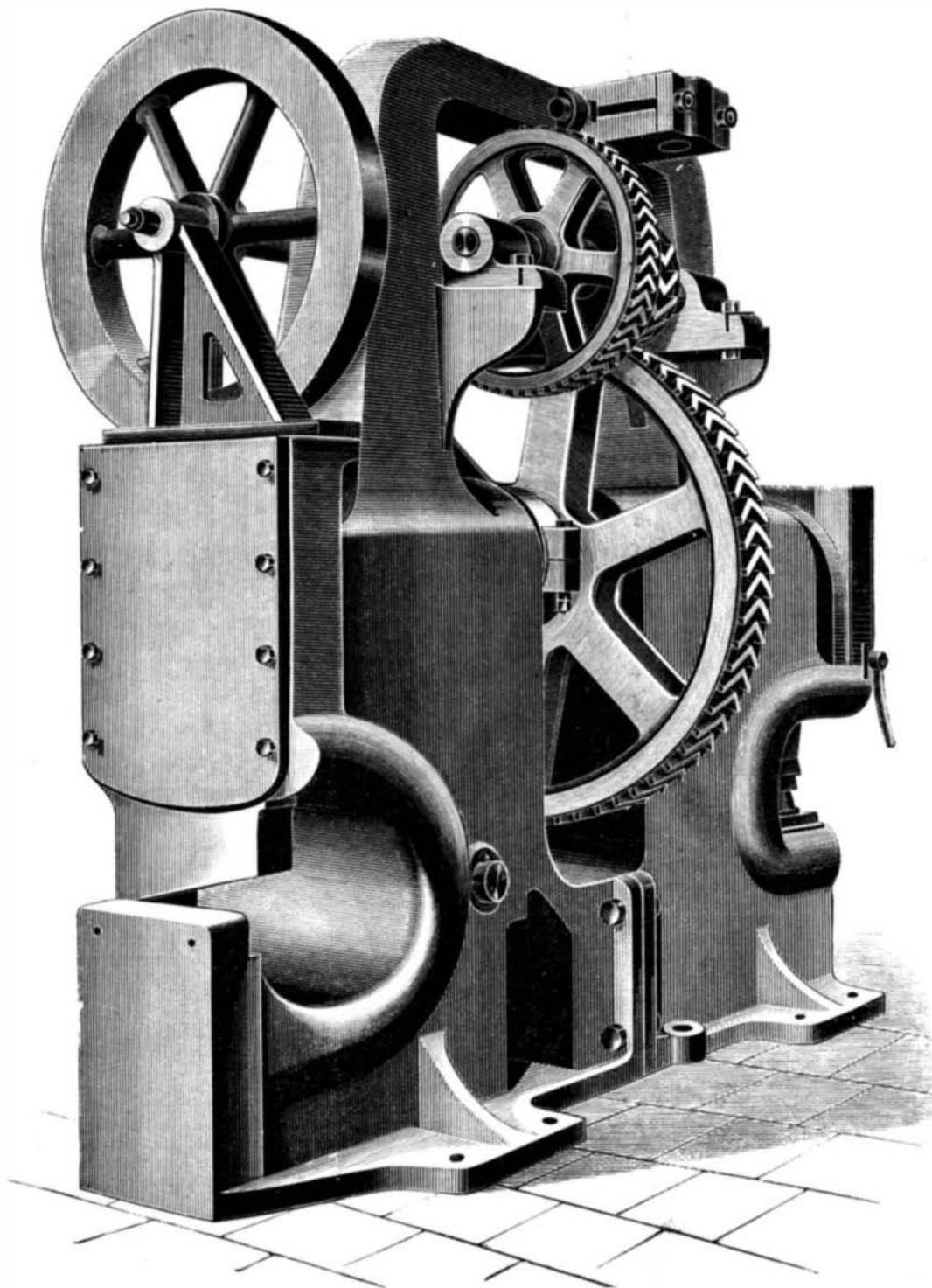
mechanism consisting of a heavy weight which is allowed to fall, and which during its flight, at certain points determined upon beforehand, breaks the current of the electro-magnet.

The chronograph is shown in detail in the right hand view of the engraving. The index is located at the center of the apparatus together with the index needle.

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IMPROVED PUNCHING AND SHEARING MACHINE.

The punching and shearing machine illustrated here-with was designed and constructed by the Southgate Engineering Company, near London. Our illustration is from *Engineering*. The gear is all of the double helical form, strong and yet noiseless in working. The punching gap is 30 in. deep, so that it can punch a hole in the center of a plate 5 ft. wide. The lift is 3 3/4 in., and the main shaft is of steel and of large dimensions. All bearings are bushed, above and below, with gun metal. There is a bearing in center, directly above the angle shears, and the parts that make up the angle cutting arrangement are all of steel and of extra strong proportions. It is made to carry a crane in the center, the supporting seats of which are shown in the engraving. The machine generally gives the impression of great strength, compactness, and adaptability to the work it has to perform.



IMPROVED PUNCHING AND SHEARING MACHINE.

SCHUTZENBERGER, in a recent number of the *Comptes Rendus*, has described experiments which apparently conclusively prove that nickel is volatile in presence of hydrochloric acid. Both when nickel chloride is reduced in a current of hydrogen and when hydrochloric acid is passed over finely divided nickel, traces of nickel chloride are found in the further part of the tube when heated to dull redness. Precautions were taken to prevent any mechanical conveyance of the nickel salt, so that the effect must be analogous to that of the action of carbon monoxide on nickel and iron.