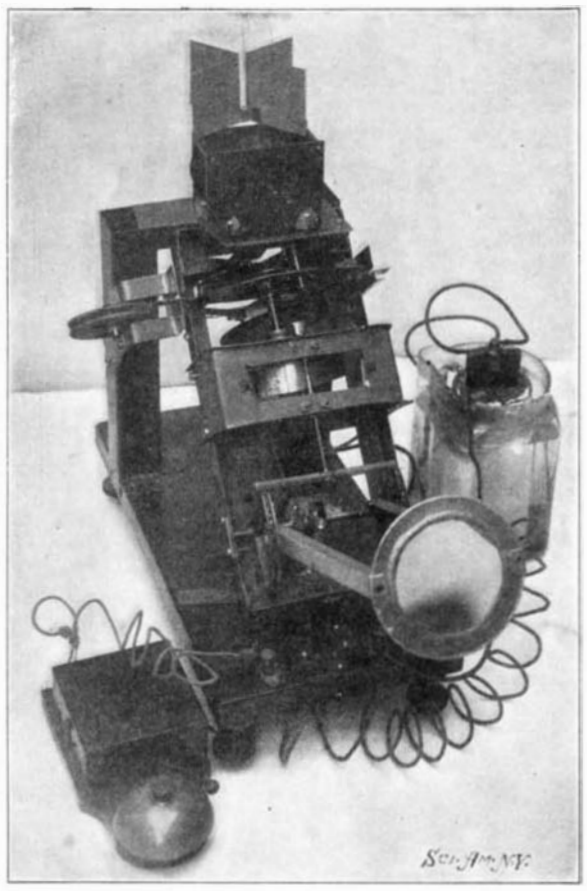
AN INSTRUMENT FOR INDICATING MEAN ASTRONOMICAL NOON.

BY EMILE GUARINI.

The time that separates two successive passages of the sun across the meridian is not always the same. Except for four days of the year there is always a



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difference between the time of an accurate clock (mean time) and the time indicated by a sun-dial (true time). This difference is called the time equation. On February 10, in France, the equation shows a retardation of 14.5 minutes, and on November 3 an advance of 16.5 minutes, a total difference, therefore, of 31 minutes. Since 1891, the time of Paris has been the legal time of France. It follows, therefore, that cities lying to the west or east of Paris would have to add to or subtract from the local time in order to legalize their timepieces. It is the purpose of the apparatus illustrated in the accompanying engraving to effect this correction in the equation of time automatically, and to indicate the exact moment when the sun reaches the meridian.

The apparatus consists of a substantial base plate upon which is carried a frame pivotally mounted on an axis parallel with that of the earth. At right angles to this frame a lens holder is carried, hinged at its lower end and provided with a lens, the focal point of which lies exactly on the line joining the pivots of the first mentioned frame. A clock train is disposed on the frame to the west of the meridian, in such a manner that its weight will always tend to bring the frame to this side. It will be observed from the illustration that the lens holder is operated from this clock train by chains, the movement being so timed that the lens keeps pace with the sun on its journey through the heavens. The lens has two movements, the one from east to west, the other from side to side around the pivots of the frame, both movements being automatically controlled from the clock train, and both being so timed that the rays of the sun are constantly received by the lens.

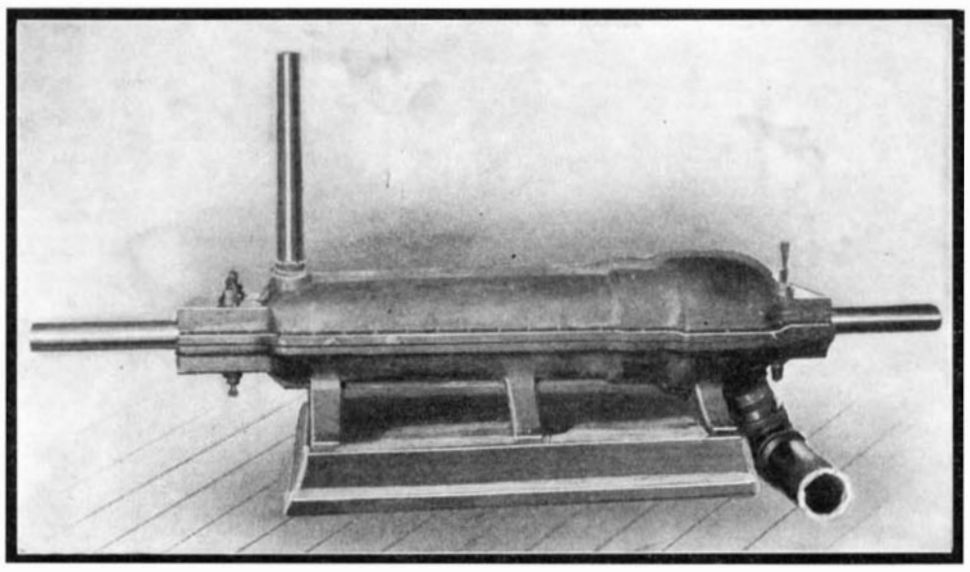
At Paris the true noon agrees with the mean noon on the 16th of April, the 15th of June, the 1st of September, and 25th of December. On these days the frame inclines neither to the right nor to the left, and the focal axis of the lens lies exactly in the plane of the meridian. When the sun crosses the meridian after mean noon, the lens, by inclining to the right, is alined with the sun before true (solar) noon; and when the sun crosses the meridian before mean noon, the lens inclines to the left and is not in line until after its passage of the meridian. The focal axis is thus displaced by a total angle of 7 deg. 42 min., corresponding to a difference of 31 minutes of time. In this double motion of right ascension and declination, the focus of the lens is always projected at the same point.

At the point where the rays are concentrated is placed a small barometric chamber of a U-shaped tube containing mercury and ether. Two insulated iron wires descend to the mercury and are connected with one or more electric bells placed at any suitable distance. When the focus falls upon the chamber the ether expands and acts upon the mercury, which, in contact with the naked extremities of the wires, completes the circuit, thus ringing a bell, and indicating mean noon.

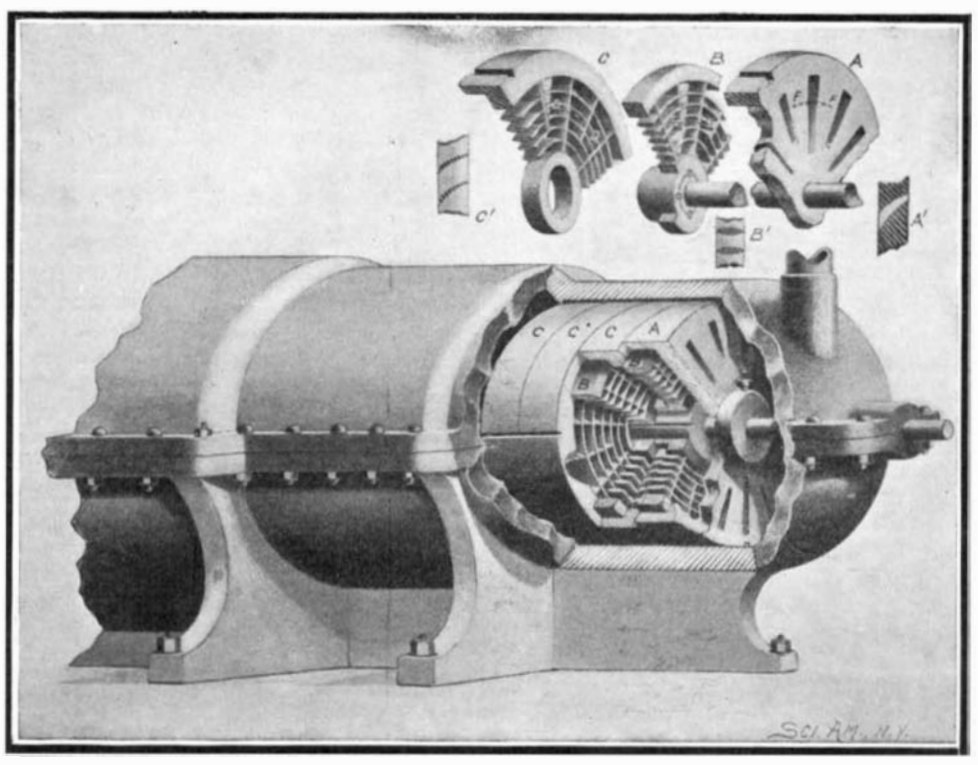
The apparatus may be installed at any point whatever of France after regulating it once for all by means of the leveling screws. A very ordinary clockwork movement is sufficient, since a variation of one hour a day could not possibly vitiate the result.

NEW STEAM TURBINE.

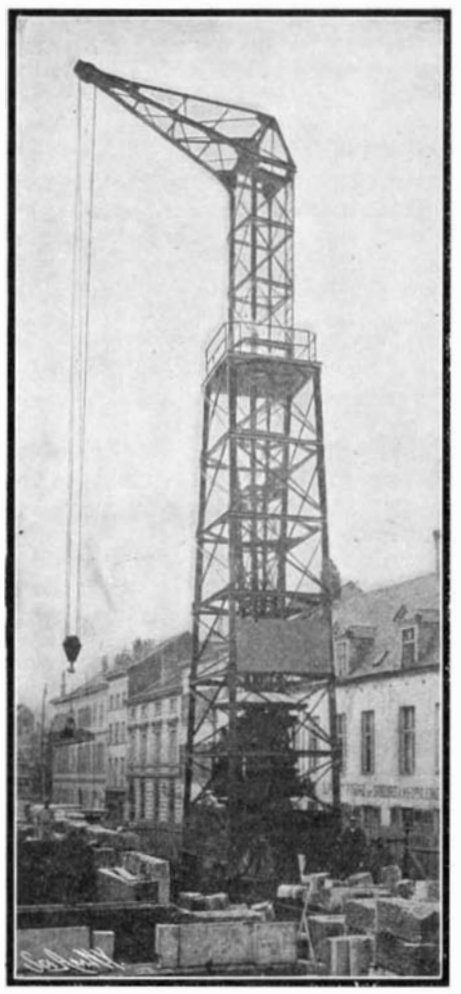
A patent has just been granted to Mr. Morgan D. Kalbach, of Lebanon, Pa. (Box 381), on a steam turbine of novel construction. The turbine is so designed as to secure the greatest expansion of steam and the utmost velocity possible in an apparatus of this class. One of our illustrations shows a portion of the turbine broken away to show detail. From this it will be observed that the turbine casing is made up of two sections bolted together and formed to provide a series of connecting cylinders of gradually-increasing diameter. Shoulders are formed at the end of each cylinder between which a series of partitions are held. At the inlet end of each cylinder a partition, *A*, is placed and the remainder of the space is taken up with a series of stationary disks or partitions, *C*. The partitions *A* and *C* are keyed to the casing so as to prevent them from turning. They are formed with annular flanges which overlie a series of rotating disks, *B*, interposed between them and keyed to the turbine shaft. The partition, *A*, is formed with a



GENERAL VIEW OF THE NEW TURBINE.



NEW TURBINE WITH CASING BROKEN AWAY TO SHOW DETAIL.



NEW GERMAN TOWER ELECTRIC CRANE.

series of radial steam ports whose cross section is curved as shown at *A'*, which is a section on the line, *F F*, of Fig. A. These ports, it will be observed, gradually widen inwardly or toward the left, so that the velocity of the steam jet will be increased by reason of its expansion therein. The curved ports direct the jets at an angle against the blades of the disk, *B*, causing it to rotate. The shape of the disk *B* is indicated at Fig. B and section *B'*, which is taken on the line *E E*. The steam next encounters a partition, *C*, similar to disk *B*, but formed with curved radial vanes, at shown at *C'*, which is a section on line *D D*. These blades direct the steam at an angle against the blades of the next rotating disk, *B*. It will be observed that the segments inclosed by the radial vanes of the disks *B* and *C* are subdivided near the circumference by shorter radial arms. After traversing one cylinder, the steam passes to the next, which is shorter, but of larger diameter to allow for expansion, and so on until the discharge pipe is reached. By constructing each partition and each rotating disk in a single piece, the inventor is enabled to make the vanes very light, without reducing their strength, and much more so than in constructions where separate vanes are employed, and by subdividing the disks as the diameter increases, he is enabled to increase the surface area on which the steam can impinge.

A NEW GERMAN TOWER ELECTRIC CRANE.

BY FRANK C. PERKINS.

The accompanying illustrations show the details of construction, as well as a general view of a most interesting electrically operated tower crane constructed at Karlsruhe, by the Gesellschaft für Elektrische Industrie. The extreme height of the crane is 24.75 meters. The total height to which the hook may be raised is 23.5 meters, and the length of the arm or jib is 6 meters. This crane is designed to carry a load of 15,000 kilogrammes and the speed of lifting with a load