

# SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE. MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLVIII.—No. 4.  
[NEW SERIES.]

NEW YORK, JANUARY 27, 1883.

[\$3.20 per Annum.  
[POSTAGE PREPAID.]]

## PERREAUX'S MICROMETER MACHINE.

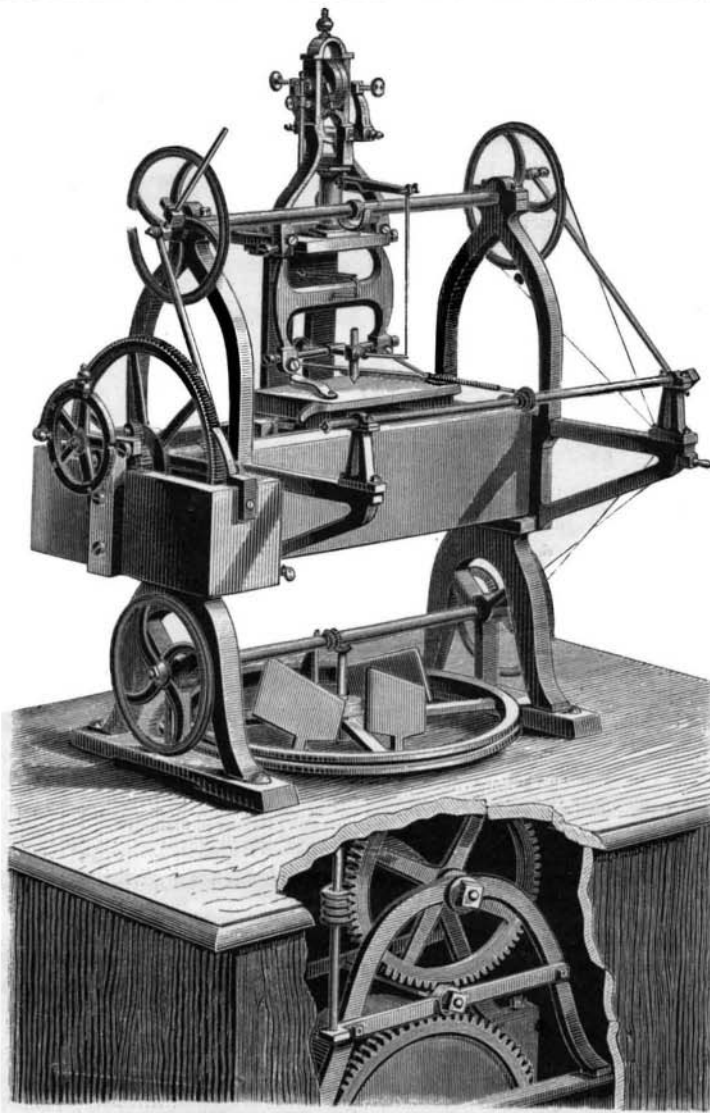
The elegant little apparatus which is shown in the accompanying cut, about one-half the natural size, is designed for ruling micrometer scales, and permits of dividing the millimeter into 1,500 parts.

The machine, which is automatic, is actuated by a clockwork movement through the intermedium of very fine silk threads. An endless screw, that engages with a wheel, moves a fly wheel carrying four vanes, which, when the velocity of the wheel reaches its maximum, spread out through centrifugal force and offer a resistance to the air, and thus cause the apparatus to run with regularity. Motion is transmitted to the horizontal axle by two bevel wheels, one of them belonging to the axle of the endless screw, and the other to the intermediate driving axle, which latter carries to the right a very small pulley, that communicates a slow motion by means of a cord to the upper driving axle. To the left of the latter there is a slot arrangement that performs the part of an eccentric, permits of increasing or diminishing the travel, and produces a backward and forward motion in a connecting rod articulated with the slot. The latter, through a click, causes the large ratchet wheel to revolve by fractions, thus bringing about a revolution in the endless screw corresponding to the spacing required in the scale.

The pitch of the screw that moves the carriage by means of a nut is one-tenth of a millimeter. The ratchet wheel has a periphery of 30 centimeters, divided into 300 teeth of 1 millimeter, which gives 3 meters of periphery, or 3,000 teeth for each millimeter of its travel.

By means of the slot above mentioned, which may be varied and regulated at will, this wheel may be caused to revolve by as many teeth as may be required, say 2 teeth for  $\frac{1}{1500}$ , 15 for  $\frac{1}{100}$ , 20 for  $\frac{1}{125}$ , 30 for  $\frac{1}{100}$ .

In the center of the table of the apparatus there is a carriage which carries a plate of glass fixed by two springs. The tracer, which is placed above this, carries a diamond set into a copper rod, which rises or falls according to the motion of the machine. When this rod is lifted by a second eccentric located in the center of the upper shaft, the ratchet wheel revolves and causes the carriage to move forward; and when the wheel ceases to revolve, the diamond at once falls with extreme precision on the glass, and traces thereon a groove which



PERREAUX'S MICROMETRIC MACHINE.

corresponds in length and depth to the distances traversed. In order to obtain such marks of varying depth, a counterpoise, capable of approaching or receding from the rod supporting the diamond, balances the latter, and, so to speak,

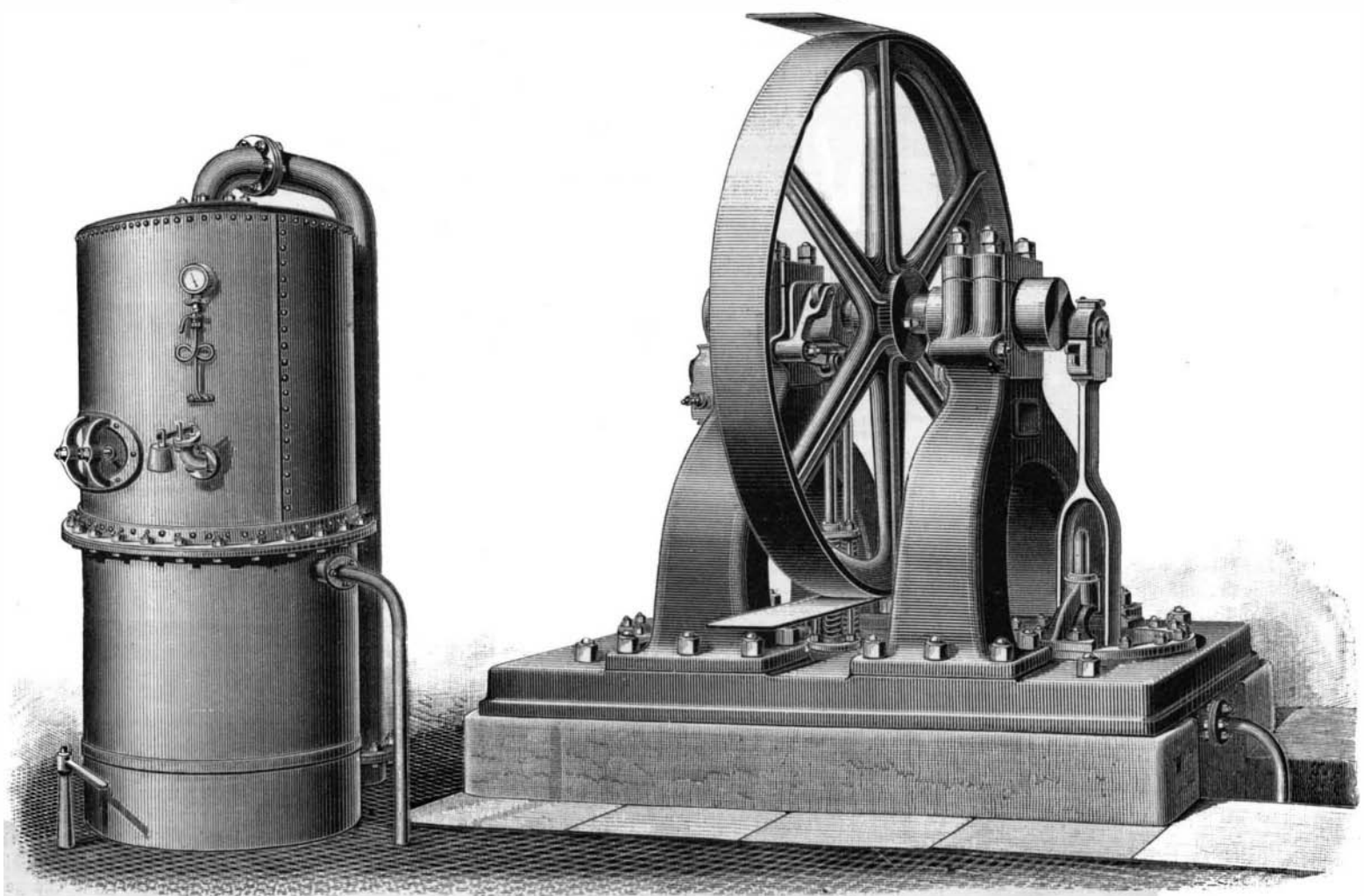
grazing the surface of the glass, makes a line corresponding to the ideal, while by carrying the center of gravity more and more toward the diamond, the lines become stronger and stronger. In measure as this counterpoise acts upon the diamond, the lines must, therefore, be further apart.

The machine is also provided with what is termed a "counter," which is designed to regulate (1) the length of the tenth divisions; (2) of the ordinary lines; (3) of the fifth divisions; and, finally, to render the reading of the lines in the microscope as easy as in ordinary measurements.

In order to obtain very perfect results with this apparatus, it is necessary to guard it against the very feeble vibrations from the exterior, such as those resulting from the passage of carriages, etc. For this reason it should be used only at certain hours of the night, when all is quiet.—*La Nature*.

## GIFFARD'S ICE AND COLD AIR MACHINE.

Among the systems that have been devised for the production of ice and cold air, one of the simplest is that of Mr. P. Giffard, which employs absolutely nothing but air and water, to the exclusion of all those inconvenient and dangerous chemical products that are used in other systems. The apparatus which is shown in the accompanying cut is based upon the principle of compression and expansion of air. It consists of two cylinders in which move pistons actuated by any sort of motor that may be preferred. One of these cylinders, called the compressor, compresses the air and forces it into the reservoir shown to the left in the figure. This reservoir is in two parts, one bolted to the other, the lower one being tubular, and its system of tube being surrounded by cold water, as is the compressing cylinder. The air, compressed to two or three atmospheres, is heated by the compression, according to a well known law. The disengaged heat is absorbed by the cold water, and the air, carried under pressure to the second cylinder (called the expansion cylinder), restores, on dilating, the work due to compression, and produces an extreme lowering of the temperature. Cold air is thus obtained at a temperature varying with the applications that are to be made of it, and which may reach 60 degrees below zero. Such is the machine in general. As for details of construction, we may note, among the improvements devised by



GIFFARD'S IMPROVED ICE AND COLD AIR MACHINE.