

THE HELIOSCOPE.

BY DR. L. HILLE.

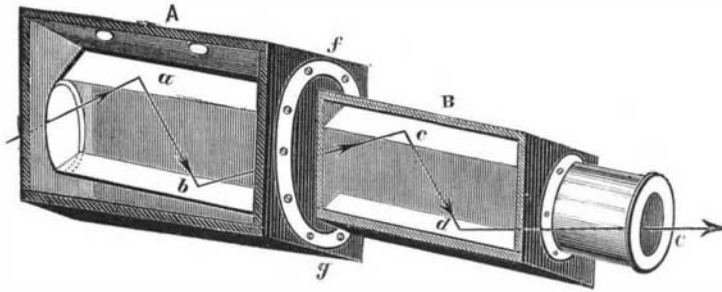
Sun spots and solar protuberances were formerly observed with instruments called sun glasses, which were made of double glasses, the intermediate space being filled with light-absorbing liquids. Good sun glasses, however, were seldom to be had, because in too many cases the expansion of the liquid, on being heated by the solar rays, would break the glasses. There were also other difficulties. Herr Merz, of Munich, has constructed a helioscope which is free from these drawbacks, and which is based on the law of polarization of light. If a ray of light strikes at an angle of 35° 25' on a mirror which is mounted so that it may be turned on its axis, and the reflected ray is thrown on a second mirror placed at right angles to the first, the light is polarized. The polarized ray is perfectly bright if the two mirrors are parallel, but it becomes more and more faint when the upper mirror is turned, until at a right angle it disappears altogether, so that the field of vision in the second mirror is perfectly dark.

In the two cases, A and B, of the apparatus are mounted four heavy mirror glasses, *a*, *b*, *c*, and *d*. The case, A, is screwed to the telescope through which the sun is to be observed. The light falls on the first mirror at an angle of 35° 25', and is reflected to the second, from whence, by means of the mirrors, *c* and *d*, in the case, B, it reaches the eye of the observer at C.

To effect the necessary diminution of the sun's light, the case, B, is arranged so that it may be turned around the axis of the apparatus by the ring, *f*, *g*. When the mirrors in case, B, are parallel to those in A, the image of the sun appears perfectly white, but the light can easily be diminished to any desired degree by simply turning the case,

B, which can be done without removing the eye from the ocular lens.

To prevent the air in the apparatus from becoming heated too much, the upper side of the case, A, is provided with a couple of holes for ventilation. The instrument has been found by practical use to be of great merit



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and easy of manipulation, and it is therefore expected that it will soon be one of the implements of every observatory and scientific academy.

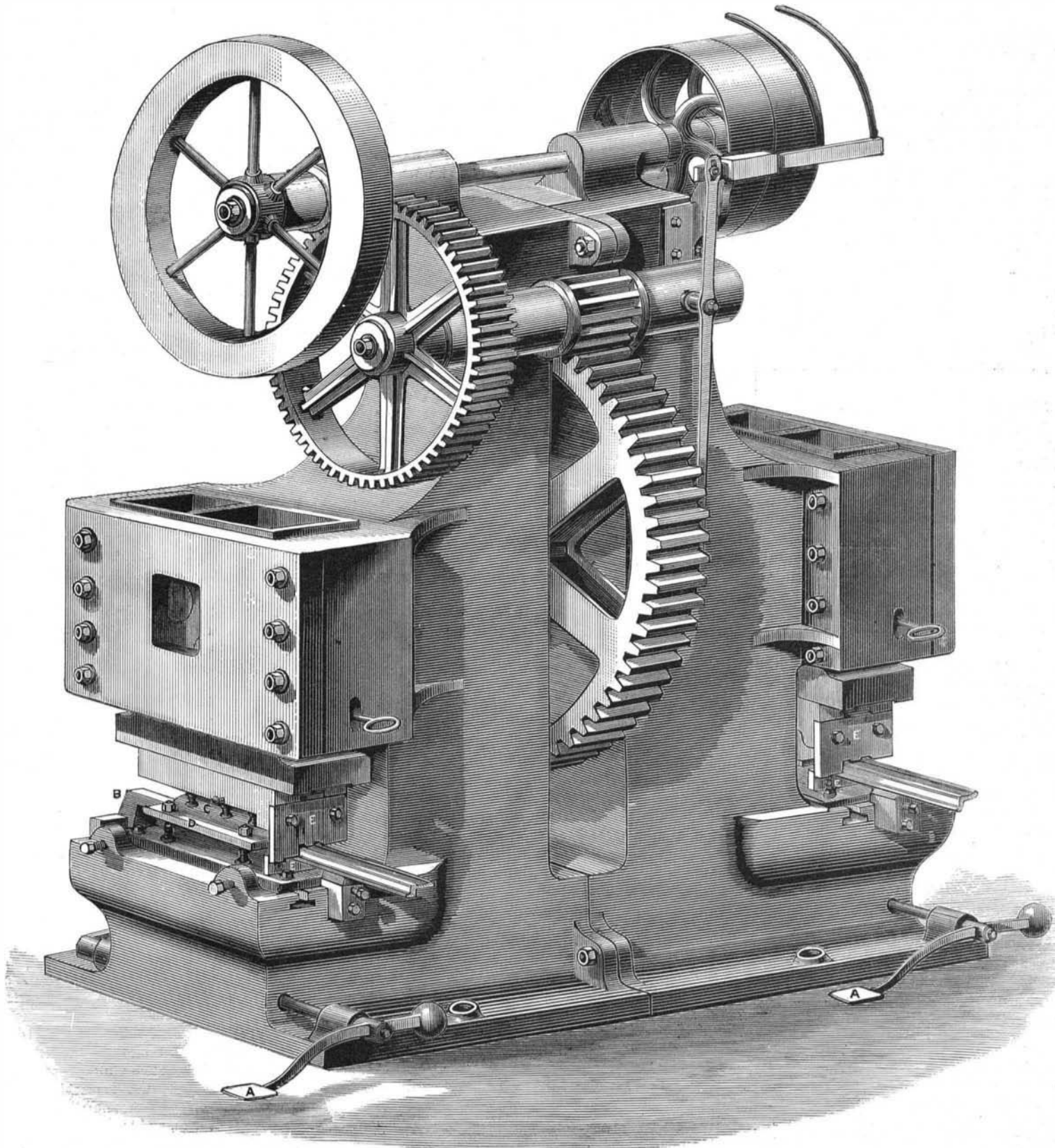
PUNCHING AND SHEARING MACHINE.

A very substantial double shearing, punching, and straightening machine has been constructed by Messrs. Wagner & Company, Werkzeugmaschinen Fabrik, Dortmund, Germany, for the Union Company's Iron and Steel Works, at Dortmund. The machine, which weighs about 15 tons, was constructed for shearing, punching, and straightening steel fish plates of any desired length, and of a thickness up to 0.9 inch, and with holes up to 1.18 inch

diameter. The bars from which the fish plates are made are brought to the machine in a red hot state, and the fish plates are completely finished by the machine, nothing further being required than to dress off the burr left by the punching. Each side finishes ten fish plates per minute. The machine, shown in the illustration (which we copy from *Engineering*), is placed directly in front of the rolls, the bars leaving the finishing grooves of the latter passing over guide rollers to the machine. The first operation performed by the latter is the cutting off of the uneven end of the bar. The attendant then presses his foot on the lever, A, thereby bringing the bar against the stop, B, and fixing the length of the fish plate; the shears, E, then cut the plate to length, and the four or six punches, C, punch the bolt holes. At the same time the block, D, descends and straightens the fish plate. When the punches and shears perform their upward stroke, the finished fish plate remains on the machine until the foot lever, A, is released, when the stop, B, is moved out of the way, and the bar being thrust forward, the finished fish

plate is cleared away. The combination of the three operations of punching, shearing, and straightening has the advantage of substituting one machine for two and dispensing with two men, only three being employed instead of five as usual. The machine also turns out its work very quickly, and it is of good and strong design.

In 1874, M. Paulet enumerated no less than 173 different processes and apparatus for preserving wood, which had been patented or described in scientific works since 1700. During the past three years the list has been largely augmented.



DOUBLE SHEARING, PUNCHING AND STRAIGHTENING MACHINE.