

## SCIENCE IN TOYS.

XIII.

An ordinary glass prism, such as may be purchased for fifty cents, is sufficient for the resolution of a beam of white sunlight into its constituent colors. By projecting the dispersed beam obliquely upon a smooth white surface, the spectrum may be elongated so as to present a gorgeous appearance. It is not difficult to understand that whatever is exhibited in the spectrum

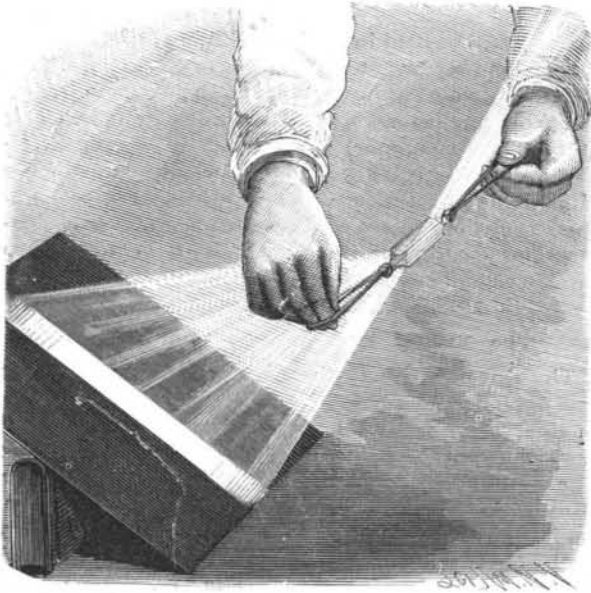


Fig. 1.—SIMPLE ROCKING PRISM.

must have existed in the light before it reached the prism, but the recombining of the colors of the spectrum so as to produce white light is of course conclusive.

The colors of the spectrum have been combined in several ways, all of which are well known. Newton's disk does it in an imperfect way by causing the blending, by persistence of vision, of surface colors presented by a rotating disk. Light from different portions of the spectrum has been reflected upon a single surface by a series of plane mirrors, thus uniting the colored rays forming white light. The colored rays emerging from the prism have been concentrated by a lens upon a small surface, the beam resulting from the combination being white. Besides these methods, the spectrum has been recombined by whirling or rocking a prism; the movement of the spectrum being so rapid as to be

beyond the power of the eye to follow, the retina receiving the impression merely as a band of white light, the colors being united by the superposing of the rapidly succeeding impressions, which are retained for an appreciable length of time.

The engravings show a device to be used in place of the ordinary rocking prism. It is perfectly simple and involves no mechanism. It consists of an inexpensive prism, having attached to the knob on either end a rubber band. In the present case the bands are attached by making in each a short slit and inserting the knobs of the prisms in the slits. The rubber bands are to be held by inserting two of the fingers in each and drawing them taut. The prism is held in a beam of sunlight as shown in Fig. 1, and with one finger the prism is given an oscillating motion. The band of light thus elongated will have prismatic colors at opposite ends, but the entire central portion will be white. To show that the colors of the spectrum pass over every portion of the path of the light, as indicated by the band, the prism may be rocked very slowly.

By inserting four screw hooks in a stand and stretching the bands over the hooks as shown in Fig. 2, the prism is adapted for use in connection with a lantern. The light emerging from the lantern must pass through a narrow slit to secure a perfect spectrum, and between the screen and the prism should be placed a screen with an oblong aperture, which will allow all of the band of light to appear upon the screen with the exception of the colored extremities. With the prism supported in this way, it is an easy matter to turn it slowly back and forth, showing on the screen the moving spectrum, which, with the more rapid movement, produces the pure white band. G. M. H.

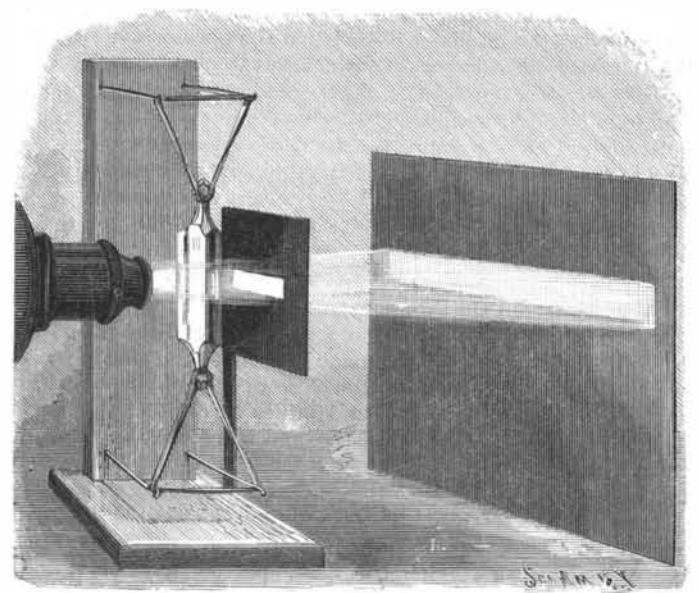


Fig. 2.—ROCKING PRISM ADAPTED TO THE LANTERN.

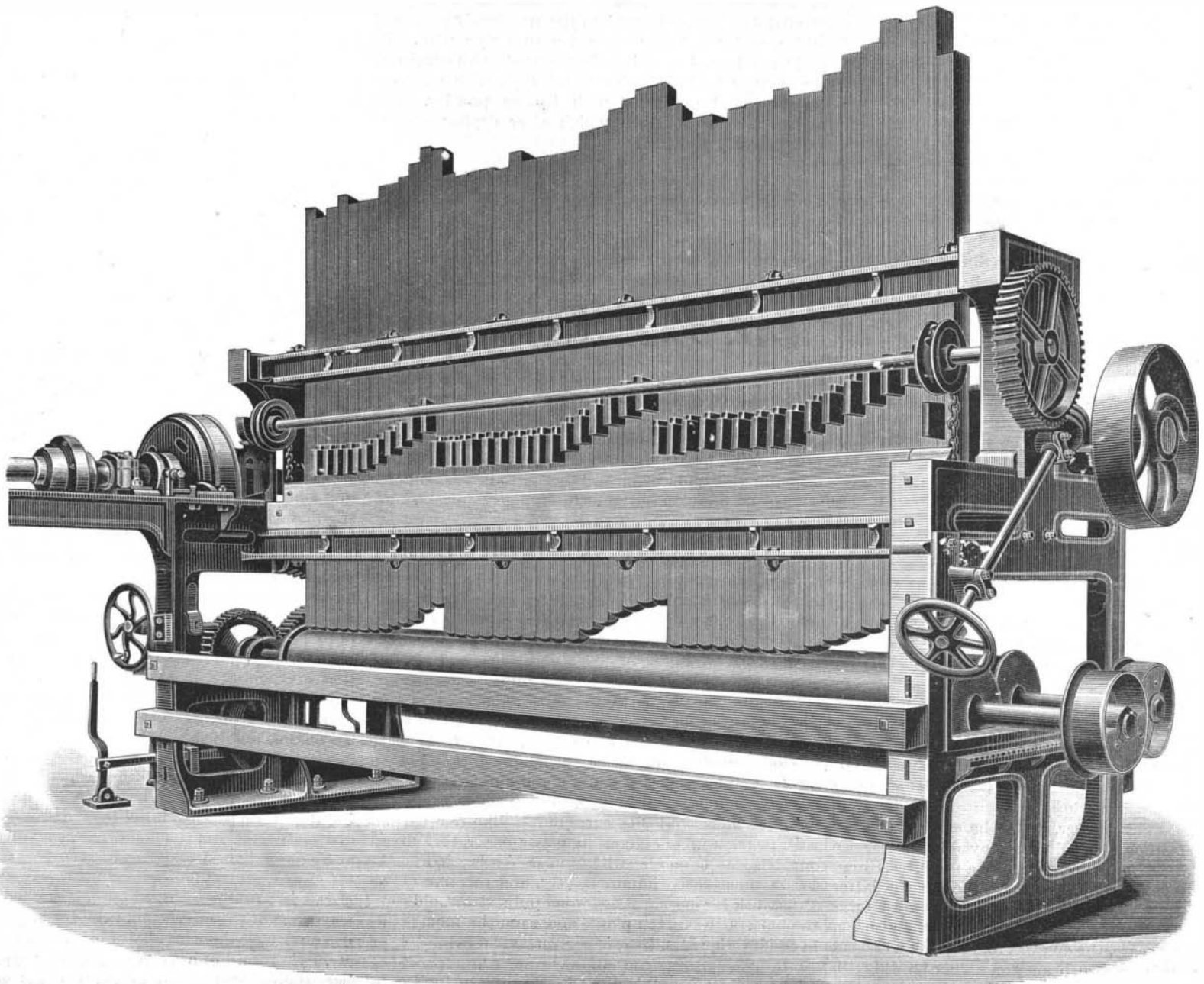
## BEETLING MACHINE.

Among the exhibits at the Manchester Exhibition none is more sure to attract attention, when at work, than the beetling machine exhibited by Messrs. J. H. Riley & Co., of Elton Iron Works, Bury, and which is here illustrated. Not only is a beetle one of the noisiest of machines, making its presence felt at a distance, but the process which it is employed to carry out is one which excites great interest in the stranger, as it deals with fabrics to be found in every household, treating them in a way apparently better adapted to

insure their destruction than to effect any improvement in their condition.

The cotton cloth to be beetled is wound on a long roller, called a beam, several pieces being wound side by side, but with a space of a few inches between the edges or selvages of the adjacent pieces. This beam is then placed under a row of fallers, made of beech wood, and arranged to have an 11 inch drop. By means of an equal number of three-armed wiper cams, which are

not shown in the engraving, the fallers are alternately raised and dropped on to the cloth, the beam being slowly rotated and reciprocated endwise at the same time. This pounding operation has two effects on the cloth. First it spreads it sideways, increasing its width in a way which is more permanent than any other process in vogue for this purpose. The non-textile reader may be inclined to ask why the cloth is not made the proper width in the loom, so as to avoid the need of a separate operation. Unfortunately, nearly all the processes to which cloth is subject tend to make it narrower. In the first place, the act of beating up the weft in the loom draws the warp threads together from 5 to 10 per cent; then in bleaching, the tension of the drawing rollers on the softened fibers continues this process, and a further loss of width is experienced, which has to be regained either by beetling



IMPROVED BEETLING MACHINE FOR FINISHING CLOTH.