The Loom.

At a recent meeting of the Manchester Association of Engineers, Mr. C. P. Brooks read a paper on "The Loom: Its History, Use, and Construction." He said the loom occupied a highly important place among the machinery employed in the industries of England, as they would realize when he stated that in 1885 there were 773,704 looms working in the United Kingdom, 560,995 of which were engaged in the cotton trade, while this year 450,000, or nearly three-fourths of the cotton looms in the kingdom, are working within a radius of 30 miles from Manchester, or, if the radius were increased to 50 miles, they found 600,000 looms within the extended distance—facts which in themselves should serve to draw their attention to an apparatus of such value and utility to the cotton trade of this country.

After giving a detailed history of the invention of the loom, the work it performs, and also various other facts in connection with it, Mr. Brooks observed that the production was one point which had been greatly improved during the past half century. In 1830 looms were running at 130 picks per minute, now an average width of loom was run at 200 picks per minute; and while, according to Edward Baines, the historian of the cotton trade, a steam loom weaver in 1823 attended to two looms, four were minded at present. This increase, however, did not strike one as being phenomenal, when the great strides obtained in other industries were considered, and he had no doubt there was still room for great improvement in this respect.

It was a notable fact that the inventions of the power loom, and many subsequent improvements and attachments, were attributable to others than those engaged in the trade, or even others than engineers. A minister, a calico printer, and a cutler and typefounder had all left their impress upon the weaving branch of the cotton trade, while Arkwright, the barber, and Hargreaves and Compton, the weavers, were important inventors in the spinning branch. However, invention seemed now to be organized as a profession, and he had no doubt that cotton machinists would not lose sight of them for improvements that might be made in the future.

In his opinion, one of the points that required attention in loom making was additional speed, which was difficult to attain. As at present constructed, the loom worked worse, caused more spoiled cloth, and even in some instances gave less production, if speeded, so that to attain the desired object the loom must be improved in its working parts, so as to give less vibration and manipulate the threads more tenderly. This would have in some measure to be attained by planing all points of the framework, hardening the working parts, and also by other means which would suggest themselves. The further simplification of the loom was also desirable. It was not now by any means an intricate machine, except the loom for fancy weaving; but the simpler the loom could be made the better, and the limit in this direction had scarcely been reached. The fancy branch of cotton weaving seemed to be developing, and there was, he had no doubt, a field opening up in which cheap, simple, and effective machinery for fabricating the ornamental cotton cloths would have great success.

SOME EXPERIMENTS IN SOUND.

BY GEO. M. HOPKINS.

The most perfect exhibition of vibrating flames can be made only with expensive apparatus; but the student can get very satisfactory results by the employment of such things as are shown in Fig. 1. A candle, a rubber tube, an oblong mirror, and a piece of thread are the only requisites, excepting the support for the mirror—which in the present case consists of a pile of books—and a little paper funnel inserted in the end of the rubber tube and forming the mouthpiece.

The thread is tied around opposite ends of the oblong mirror, and the mirror supported by passing the thread

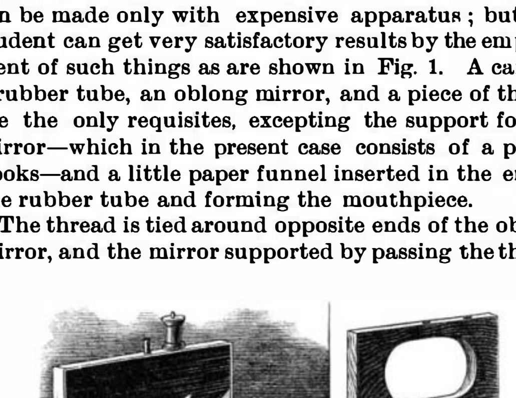

Fig. 2.—ROTATING MIRROR.

through the upper book of the pile, which juts over to allow the mirror to swing freely without touching the books. The mirror is made to vibrate in a horizontal plane by giving it a twisting motion. One end of the rubber tube is placed very near the base of the candle flame, and the other end, which is provided with the paper mouthpiece, is placed before the mouth and a sound is uttered which causes the air contained by the rubber tube to vibrate and impart its motion to the candle flame. The vibratory character of the flame is not noticeable by direct observation, but on viewing the flame in the swinging mirror, separate images of the flame will be seen. These images are combined in a series which, with a certain degree of accuracy, represent the sound waves by which the fluctuations of the flame are produced.

To show that these images result from a vibrating flame, it is only necessary to view the flame in the mirror. When no sound is made in the mouthpiece, only a plain band of light will be seen.

Fig. 1.—SIMPLE METHOD OF PRODUCING AND VIEWING VIBRATING FLAMES.

A somewhat more convenient arrangement of mirrors is shown in Fig. 2. In a baseboard is inserted a wire, one-eighth inch or more in diameter and about a foot long. On this wire is placed an ordinary spool, and above the spool a thin apertured board (shown in the detailed view), the board being about 8 inches long and 6 inches wide. The board is perforated edgewise to receive the wire. In the upper edge of the board, half way between the center and end, is inserted wire, upon which is placed a small spool, serving as a crank by which to turn the board. Upon opposite sides of the board are placed mirrors of a size corresponding to

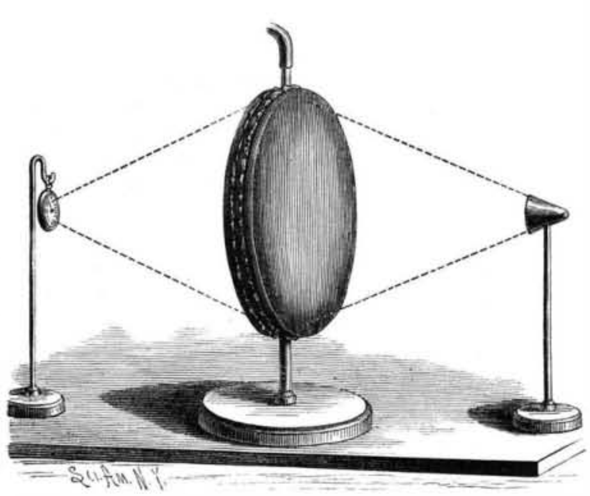

Fig. 3.—SOUND LENS.

that of the board, the mirrors being secured to the board by strips of paper or cloth pasted around the edges. The image of the flame is viewed in the mirrors as they are revolved.

In Figs. 3 and 4 is illustrated an adjustable lens for showing the refraction of sound. The frame of the lens consists of three 12-inch rings of large wire, soldered together so as to form a single wide ring with two circumferential grooves. In the central part of the ring, at the bottom, is inserted a standard, and in the top is inserted a short metal tube. Over the edges of the ring are stretched disks of the thinnest elastic rubber, which are secured by a stout thread wound around the edges of the rubber, clamping them in the grooves of the ring.

By inflating the lens through the tube with carbonic acid gas, it may be focused as desired. A watch placed at the focus upon one side of the lens can be distinctly heard at the focal point on the opposite side of the lens, when it can be heard only faintly or not at all at points only slightly removed from the focus, thus showing that the sound of the ticking of the watch has been refracted by the lens, in much the same manner as light is refracted by a glass lens.

The Light of Shooting Stars.

While commenting on a memoir presented to the Academy of Sciences, M. Cornu gave it as his opinion that the light emitted by shooting stars is not due to conflagration or to the heat of impact. In those high regions our atmosphere is too unsubstantial to render the explanation acceptable. It is much more likely the phenomenon is one of static electricity developed by simple friction, and it is well known that rarefied gases can be made to glow intensely with but very little electric fluid.

Promoting German Industry.

The Society for the Promotion of Industry, Berlin, has just offered about $5,250 in prizes for solutions of various problems. For the best treatise on mechanical engineering applied to the construction of machinery, 5,000 marks = $1,250 and a silver medal are offered; while $750 and a silver medal are to be given to the best chemical and physical inquiry into the nature of iron paints most used. The greatest prize is to be given to the most meritorious solution of the point as to how far the chemical composition of, and particularly the amount of carbon contained in, steel is a standard for the usefulness of cutlery and edge tools. The amount offered, in addition to a silver medal, is 6,000 marks = $1,500, of which 3,000 marks = $750 have been granted by the Minister of Commerce; 4,000 marks = $1,000 are to be given for the best description and actual estimate of such elevators as are most generally constructed for hoisting passengers, baggage, and goods in factories, hotels, public and private buildings, arranged after their different kinds, as well as of the necessary safety precautions and their tests, and of the regulations of police and trade companies for the building and management of these lifts, the cost of construction, the working expenses, and necessary space. A silver medal and 3,000 marks = $750 is to be given for a description of the chemical processes which take place in producing pure cellular fluid from wood and other vegetable substances by means of soda and other sulphide processes. For the second best answer the Society of Wood Cellular Material Manufactures have offered a prize of 1,000 marks = $250. The time given for the answers is to November, 1890, but in the case of the query regarding iron paints the time allowed is to November, 1894.

The Industrious Squirrel.

A Danbury farmer points to the squirrel as affording an instance of agility, quickness, and hard work. Last fall he stored several bushels of butternuts in the second story of his corn house, and recently he noticed that they were disappearing much faster than the legitimate demands for his family supply warranted. He discovered soon afterward that a squirrel, a small red one, which the farmers' boys call "chipmunks," had found a hole under the eaves of the building, and was stocking her storehouse with the nuts the farmer had gathered. As an experiment to learn how rapidly the squirrel had worked, he removed all but twenty of the nuts and set a watch upon them. Six hours afterward every nut was gone. The distance from the corn house to the tree where the squirrel had its nest was just eighty rods. In going for a nut and returning with it the sprightly little animal had to travel a distance of 160 rods. Computation showed that the theft of the twenty nuts required just ten miles of travel. But this did not include all. Several times dogs frightened the squirrel, and it had to turn back, and twice the family cat got after it, requiring it to take a circuitous route to reach the storehouse. The nest was examined soon afterward, and a big, fat, lazy male squirrel was found snoozing quietly while his little mate was performing a prodigious feat to supply him with food. —*N. Y. Sun.*

The Paradoxes of Science.

The water, says a writer in *Blackwood's Magazine*, which drowns us, a fluent stream, can be walked upon as ice. The bullet which, when fired from a musket, carries death, will be harmless if ground to dust before being fired. The crystallized part of the oil of roses—so grateful in its fragrance, a solid at ordinary temperatures, though readily volatile—is a compound substance containing exactly the same elements, and in exactly the same proportions, as the gas with which we light our streets. The tea which we daily drink with benefit and pleasure produces palpitation, nervous tremblings, and even paralysis, if taken in excess; yet the peculiar organic agent called theine, to which tea owes its qualities, may be taken by itself (as theine, not as tea) without any appreciable effect. The water which will allay our burning thirst augments it when congealed into snow; so that it is stated by explorers of the Arctic regions that the natives prefer enduring the utmost extremity of thirst rather than attempt to remove it by eating snow. Yet if the snow be melted, it becomes drinkable water. Nevertheless, although, if melted before entering the mouth, it assuages thirst like other water, when melted in the mouth it has the opposite effect. To render this paradox more striking, we have only to remember that ice, which melts more slowly in the mouth, is very efficient in allaying thirst.

Fig. 4.—SECTION OF SOUND LENS.