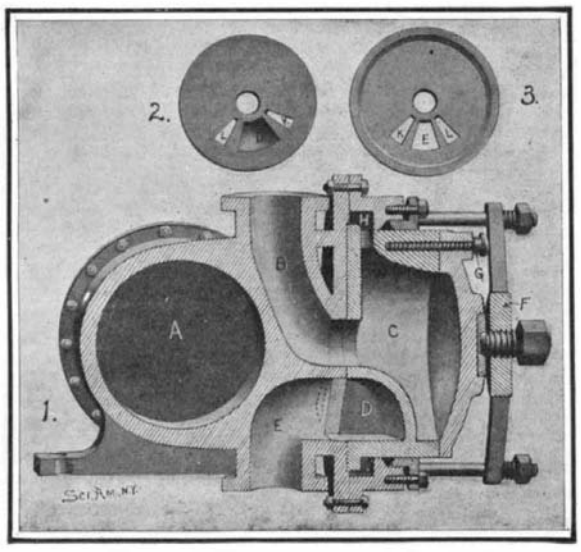
a scale which shows the exact tension of the warp threads due to the coiled spring. By means of this scale the weave may be closely regulated. A flat disk provided with ratchet teeth is suitably secured to the end of the warp-beam and covers the opening in the other disk containing the coiled spring, to one end of which is secured a pin carried by the closing disk. The disk containing the spiral spring carries a pawl which engages with the ratchet teeth to limit the return travel in rewinding. Should a greater return travel be desired, it is merely necessary to lift the pawl. The coiled spring maintains an even and steady tension on the warp threads, which is absolutely independent of meteorological conditions, an immense advantage over the old rope and weight system.

NEW ROTARY VALVE FOR STEAM ENGINES.

A new rotary valve for steam engines has recently been invented, which is designed to relieve the valve seat of boiler pressure, and to keep the balance of the valve without regard to the pressure in the boiler. The manner in which this result is obtained will be readily comprehended by reference to the accompanying engraving, which illustrates a section through a steam engine equipped with the improved valve. The cylinder is shown at *A*, and *B* is the port admitting steam from the boiler into the combined valve and steam chest, *C*. The bottom of the steam chest or valve, as illustrated in Fig. 2, is formed with a central opening communicating with the steam supply port, *B*, and is also provided with two radial openings, *K* and *L*, between which is a cut-away port, *D*. The valve seat, which is shown in Fig. 3, is similarly formed with radial ports, the port, *K*, communicating with one end of the cylinder, and port, *L*, with the other, while between them is the exhaust port, *E*. The bottom of the valve is formed with a flange which projects into



NEW ROTARY VALVE FOR STEAM ENGINES.

an annular balancing chamber, *H*, formed by a cylindrical casing bolted to the valve seat. Communication between the interior of the valve and this chamber is had through the port shown. A steam-tight joint is made between this casing and the valve. The valve is mounted to rock in the casing and is held under pressure by a screw in the spring-pressed spider, *F*. The link which connects the valve with the rocker is shown at *G*. In operation the cut-away port, *D*, alternately connects the ports *K* and *L* with the exhaust port, *E*. The flange at the bottom of the valve extends into the balancing chamber to an extent sufficient to balance the excess of outward pressure due to the ports cut in the bottom of the valve, so that the valve is held down properly on its seat. It will be understood, of course, that the valve seat must be fitted to a ground joint in order to secure the desired action and that if the area of the flange be equal to the area of the ported openings a perfect balance will be secured at all times. Mr. John Cruikshank, of Yorktown, Virginia, is the inventor of this improved rotary valve.

A STRIKING ILLUSION APPARATUS.

The field of inventions pertaining to stage effects and illusions is continually on the increase. We illustrate one of the latest, recently patented by Mr. R. B. Smith, Sydney, New South Wales, Australia, which possesses points of peculiar interest and novelty.

The illusion consists in showing a floating automobile about four feet above the stage, in motion, apparently traveling in the air with its occupant, going across the space of the stage, turning around and returning, then taking a flight upward in the air, until it is completely upside down, with the chauffeur there operating in the same way as in the beginning, and returning again to the stage. Our illustration gives an idea of the effect, showing the machine in two positions. It is necessary that the chauffeur be securely held in the machine to prevent him from dropping to the floor when in the reverse position.

Simple mechanism operated from behind the scenes is employed for producing this startling effect, and combined with peculiarities of lighting easily deceives the eye of the spectator.

Motion to the wheels is imparted by silent electrical

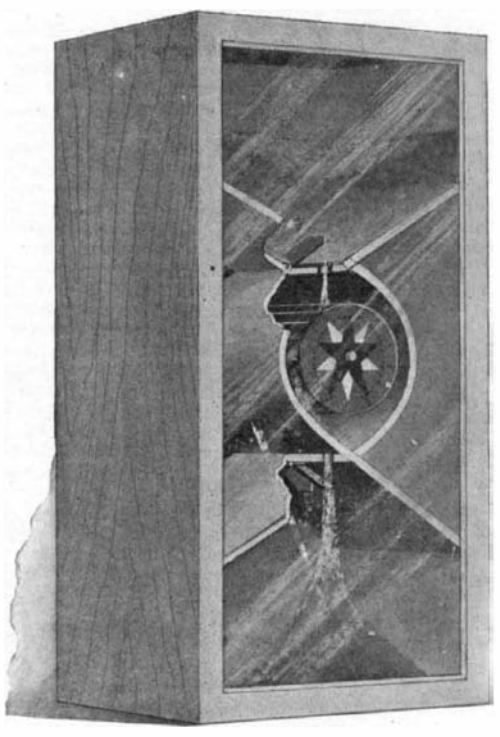
A STRIKING ILLUSION APPARATUS.

means. It is presumable that other devices can be utilized to imitate the noises observable in gasoline-driven machines in order to make the effect more realistic.

In the beginning, as the curtain rises, the automobile is observed floating in the air. The chauffeur, a lady perchance, walks in upon the stage and apparently steps through space as she gets into the machine. To show that it really is in the air, the magician passes a wand all around under the machine. The chauffeur starts the wheels rotating by a lever, and the illusion is continued. At its termination, the chauffeur steps out on what appears to be air and walks off from the stage, leaving the audience mystified as to how this effect was obtained.

SAND WHEEL TOY.

The use of sand falling on a wheel provides an excellent motive power for operating small toys of various descriptions. However, this form of toy is usually so constructed that the movement of the sand cannot be seen and the natural curiosity of the child is aroused to such an extent by the mysterious power within the toy that he is very liable to destroy the toy in order to discover the secret of its action. It has occurred to Mr. Harvey I. Dedrick, 26 South Center Street, Schenectady, New York, that the toy would lose little,

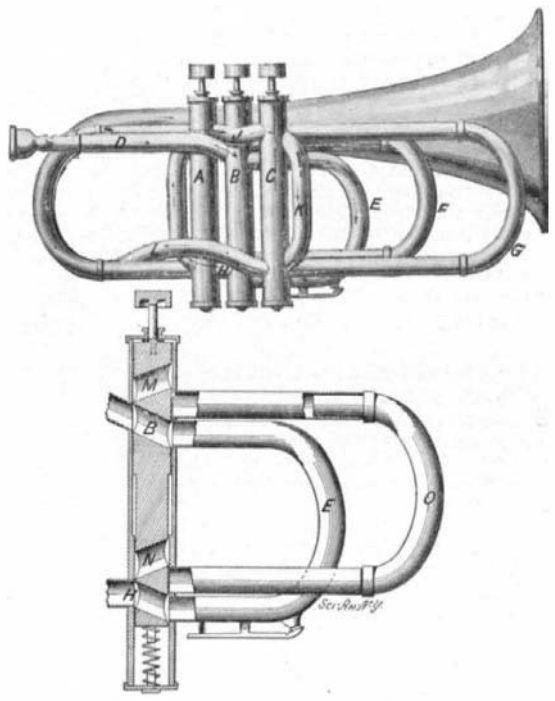


SAND WHEEL TOY.

if any, of its charm, were it so designed as to exhibit all its working parts, and by thus letting the child into the secret, the life of a toy would be materially lengthened. Aside from this feature Mr. Dedrick has designed an improved valve which will prevent the wheel from becoming clogged with sand and has also provided means for keeping the sand out of the bearings of the wheel. In the accompanying engraving the general design of the improved toy and the construction of the sand valves are clearly illustrated. The box containing the mechanism is provided with a glass cover so that the flow of sand can be observed. Sand hoppers are provided at opposite ends of the box, after the fashion of an hour glass. Between the hoppers is a chamber, in which a sand wheel is mounted. The sand flows through an opening in the bottom of the upper hopper, onto the vanes of the sand wheel, rotating it like an overshot mill wheel. Thence the sand flows out through an opening into the lower hopper. When the upper hopper is emptied, the toy may be reversed so as to continue the flow of sand and the rotation of the wheel. To prevent the wheel chamber from becoming choked with sand, it is desirable that the sand should flow out more rapidly than it can enter. To this end each hopper is provided with a hinged valve covering its opening into the sand wheel chamber. The valves are operated by gravity, so that no matter which end of the toy is up the valve of the upper hopper will fall to closed position, while the lower one will swing open against a stop. Sand then flows into the wheel chamber, through a small perforation in the upper valve, but flows out into the lower hopper through an unobstructed port.

A NEW WIND INSTRUMENT.

Letters patent have recently been granted to Mr. Harman J. Ellis, of Brooklyn, Wis., covering an improved form of musical instrument. The invention, illustrated in the accompanying engraving, relates to wind instruments such as cornets, horns, and the like, and provides means for readily lowering or raising the tone by the manipulation of corresponding valves, the arrangement being such that the formation of abrupt bends for the air passages is completely avoided to insure a rapid and unobstructed flow of the air. The complete view of the illustration shows the invention in the form of a cornet, while the detailed view shows the cross section of one of the valves. As shown in the side elevation of the entire instrument, it is provided with three valves, *A*, *B*, and *C*, arranged one alongside the other and each having a spring-pressed piston adapted to be manipulated by the player, and two sets of ports. The valve, *B*, is connected at its forward side with a mouthpiece-tube, *D*, carrying the usual mouthpiece, and when the several valves are in their normal non-pressed positions, the air forced through the mouthpiece and the tube, *D*, passes by way of a port into a U-shaped or return-bend tube, *F*, connected with the valve, *B*, at a port which joins with a short connecting tube, *H*, leading to the valve, *A*, at a port which connects by a tube with another port of *A*. This is connected by a short tube, *J*, with a port of *C*, connected by a tube, *K*, with another port of *C*, which in turn is connected by a tube, *L*, with the bell of the instrument. From the foregoing it will be seen that each of the valves, *A*, *B*, and *C*, has a return or U-shaped tube connected at both ends to the corresponding valve-casing at or near the upper and lower ends thereof, and each tube normally registers with a set of ports in the corresponding valve. When a valve is pressed, the shorter tube is cut out and the longer tube is brought into action to provide a correspondingly longer air passage and a consequent change of tone. When it is desired to lower the open tone one-half an interval, it is necessary to press the piston-valve of the valve, *B*. When it is desired to lower the open tone one full interval, the piston-valve of the valve, *A*, is pressed, and when the valve *C* is operated the tone is lowered an interval and a half.



A NEW TYPE OF WIND INSTRUMENT.