SCIENTIFIC AMERICAN

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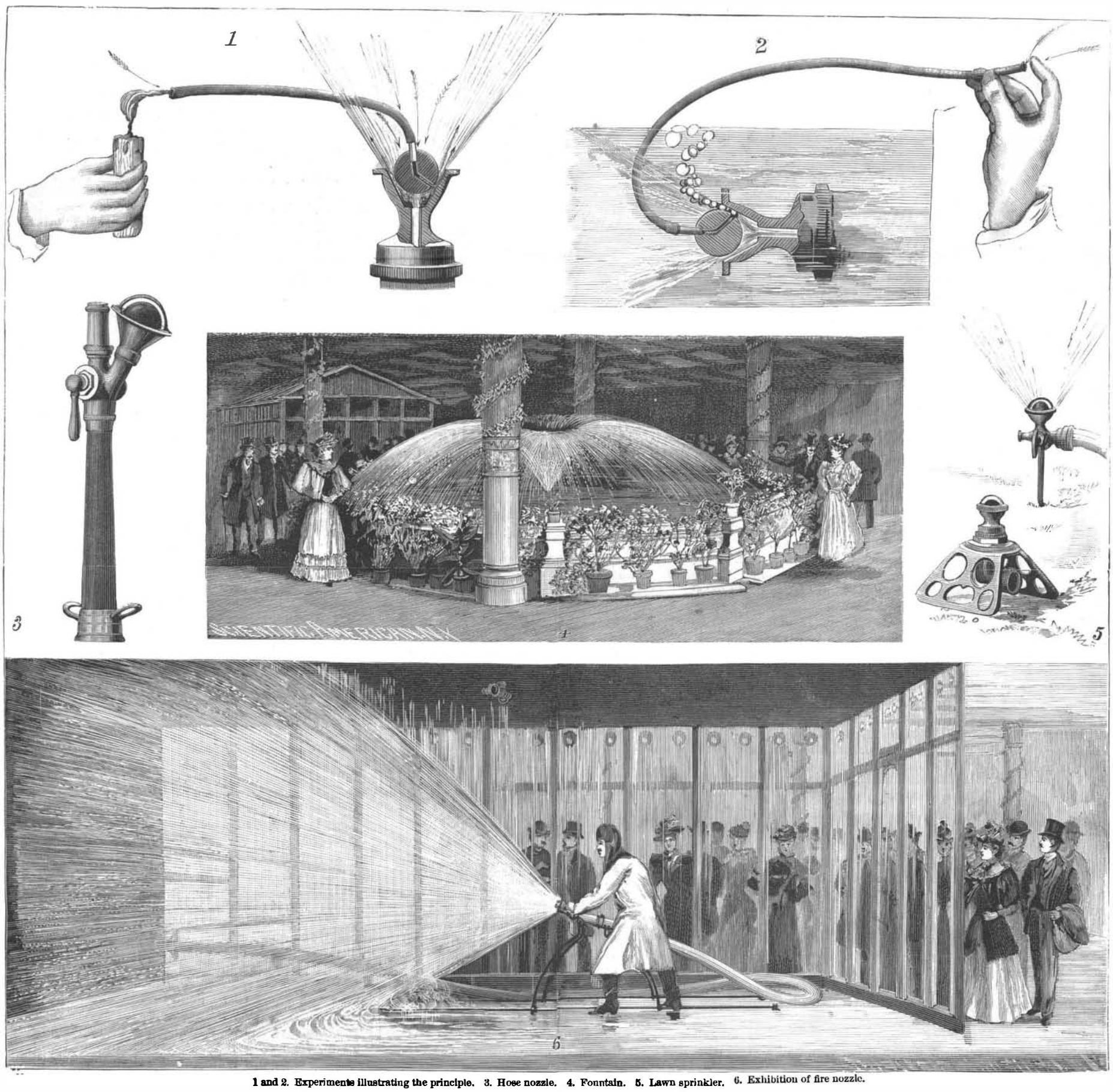
THE BALL NOZZLE.

One of the most attractive exhibits for purely commercial purposes to be seen in this city is that of the American Ball Nozzle Company, at 837-847 Broadway. The attention of the passer-by is attracted by the rich floral decorations and fountains, and by the ever-interested throng which enters the place. The visitor will soon learn that the whole affair is a grand method of advertising a contrivance which, although exceedingly simple, is a mystery to the great majority of spectators. The first object shown is a cup-shaped nozzle in which is placed a ball of light material; and although the ball in this particular exhibit is not confined in any way, it is found impossible to blow it from the cup-shaped nozzle.

The why and the wherefore of this phenomenon are not explained by the exhibitor, and he intimates that no one has explained it, or can do so. We think, however, the reader will be able to understand the phenomenon before we have done with our explanation. Be this as it may, the device is ingenious and effective. The cup-shaped nozzle with the ball in it, as shown in the engraving, and a wire guard for preventing the accidental escape of the ball, constitute the invention. This nozzle throws a fine cone of spray, whether used as a fire nozzle, as in Figs. 3 and 6, as a fountain, as in Fig. 4, or as a lawn sprinkler, as shown in Fig. 5. While in operation in either of these capacities, the ball moves rapidly with a gyratory motion, and causes the water to escape in the form of a large cone of spray. In fire extinguishing this is very effective, as the volume of water is enormous and the area covered very large. It serves as a protection to the fireman, and thus enables him to approach near the fire. It is very efficient in the protection of property adjoining the fire. For interior fires, especially those in cellars, ships' holds and similar situations, it has an undoubted advantage.

It has still another application, peculiar to itself, that is the protection of lumber yards and areas containing quantities of combustible material. By the use of stand pipes provided at the top with ball nozzles a radius of 100 feet for each stand pipe and nozzle will be covered. It will thus be seen that a large yard may easily be protected from fire brands and flying sparks and cinders by a few such nozzles. As a lawn sprinkler the advantages of the ball nozzle are obvious.

There is in the exhibit to which reference is made a large watertight room with three glass sides, through which spectators may look, and at intervals the exhibitor enters, turns on the water and causes it to pass through the plain nozzle; then, to show the difference between the effect of the plain jet and the same quantity of water passed through the ball nozzle,



1 and 2. Experiments illustrating the principle. 3. Hose nozzle. 4. Fountain. 5. Lawn sprinkler. 6. Exhibition of fire nozzle.

THE BALL NOZZLE.

he immediately turns the water from the plain nozzle to the ball nozzle, and a surprising effect is produced. The entire room is filled with spray, and it is impressively shown how small would be the chances for fire in such a room. The nozzles are made double as shown in Fig. 3, to permit of throwing either a solid or spray jet, the passage of the water to either one or the other of the branches of the nozzle being controlled by the threeway valve. The lawn sprinkler is either mounted on a stand or a short spike as shown in Fig. 5.

The explanation of the phenomenon of the ball nozzle is as follows: The water issuing at the sides of the ball produces a zone of vacuum, where the water is tangent to the ball, on the principle of the ejector. Air pressure upon the outer surface of the ball tends to force it into this vacuum zone, and as the area of the ball covered by the vacuum is many times larger than the aperture through which the water escapes to the cup of the nozzle, the total air pressure on the ball is greater than any water pressure that would be likely to be exerted upon the ball; but as the air pressure is limited to a little less than fifteen pounds per square inch, we can conceive that there might be a water pressure which could no longer be opposed by the air pressure, and as a consequence the ball would be blown out of the cup.

To prove that a vacuum is formed at the zone where the water is tangent to the ball, we have caused a ball to be perforated, as shown in Figs. 1 and 2, and have proved that a vacuum exists at the zone of tangency, by connecting a tube with the perforation, and holding a candle at the mouth of the tube, as shown in Fig. 1. The drawing of the candle flame into the tube shows that air is rushing in to supply the vacuum produced by the escaping water.

In Fig. 2 the parts are placed in similar relation to each other, but the ball nozzle is submerged. In this case the outrush of the water produces a vacuum as before and the air rushing in to satisfy the vacuum escapes in bubbles through the water. When the tube is closed by the finger, thus preventing the air from passing to the nozzle, the bubbles cease.* These explanations and experiments indicate the nature of the phenomenon of the ball nozzle.

The American Ball Nozzle Company will make an attractive exhibition at the Atlanta Exposition, and will furnish the fire protection and several of the fountains.

The Wood of Most Uses.

Theoretically speaking, says Timber, of London, Eng., the oak is the wood which can be put to the greatest variety of uses, but, as a matter of fact, the pine is most used, on account of its abundance. The timber of the oak, which combines in itself the essential elements of strength and durability, hardness and elasticity in a degree which no other tree can boast, has been used as a material for shipbuilding since the time of King Alfred. It is also employed in architecture, cabinetmaking, corving, mill work, coopering, and a thousand and one other ways, while the bark is of great value as furnishing tan and yielding a bitter extract in continual demand for medicinal purposes.

The timber of the pine is also used in house and ship carpentry. Common turpentine is extracted from it, and much tar, pitch, resin and lampblack. Splinters of the resinous roots serve the Highlanders instead of candles. Fishermen make ropes of the inner bark which the Kamchatdales and Laplanders steep in water and utilize for making a coarse kind of bread. The oil obtained from the shoots of the dwarf pine is a kind of universal medicine among the peasants of Hungary, while the soft grained silver fir is in much requisition for the sounding boards of musical instruments, and the Germans employ it almost exclusively in their vast toy factories. In the manufacture of lucifer matches, and, above all, paper pulp, thousands and tens of thousands of acres of pine forests are cut down every year, and the timber, constituting the chief material of English and American builders, is more used than all other kinds of wood put together.

Ruwenzori.

Mr Scott Elliott has been investigating the botany of Ruwenzori, the giant mountain of Central Africa. Up to 7,000 feet he found grass and cultivation; then begins the forest, which up to 8,600 feet consists of deciduous trees, sometimes with thick undergrowth, sometimes quite open, with a profusion of ferns, mosses, and creepers. From 8,600 to 9,600 feet bamboos grow, and the predominant feature is the wetness of everything. Only very watery plants grow among the roots. Above 9,600 feet tree heather takes the place of bamboo, and seems to extend to the snow, which Mr. Elliott could not reach, and even beyond. In one attempt to reach the summit he found what seems to him the Alpine lady's mantle. On the mountain birds and animals are extremely scarce. He saw a sun bird, green yellow, and crimson, above 10,000 feet, and also saw a robin and a goldfinch.

* For an account of interesting experiments with the ball nozzle the reader is referred to SUPPLEMENTS 37, 47 and 51.

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(Illustrated articles are marked with an asterisk.)

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For the Week Ending July 13, 1895.

Price 10 cents. For sale by all newsdealers.

THE NEW YORK STATE FISH HATCHERY, COLD SPRING HARBOR.

A very commodious and cheerful looking building is that occupied by the New York Fish Commission at Cold Spring Harbor, Long Island. It stands at the level of the Sound, overshadowed on the west by forest covered hills. Between the highway and the building are the fish ponds, bordered with grass and separated from each other by flower beds and trees. The ground was given in perpetual lease by Mr. John D. Jones, the generous benefactor of the Biological School located here. This large frame building, erected in 1887, takes the place of the little brick one near by, where the work was at first carried on. Of the seven hatcheries in New York, this is the only one so near the coast that it is equally well adapted to raising both fresh and salt water fish. Another advantage is that during the summer months, when the fish need least attention, lobster hatching can be carried on.

The eggs are obtained from lobster men along the Long Island and Connecticut shores, who take them from the "swimmerets," where the female carries them for a year. They are brought in water to the hatchery and placed in tall glass jars; into the bottom of these a stream of salt water passes constantly, keeping the eggs in rapid motion; by means of a siphon, the water is carried out of the jar into a rectangular aquarium; with it go some eggs, and all the baby lobsters, as they burst their shells, straighten out and begin to swim upward.

Of these eggs, 6,900 weigh a liquid ounce, and from 125,000 to 130,000 are placed in each jar at a time; generally, within five days, all are hatched. When they have passed over into the aquarium, there is plenty of room for the struggle which begins with the first hour of the lobster's life. As we watch the rapid movements of the pinkish-white little things, just out of the shell, from a quarter to half an inch long, we see some are carrying or eating eggs. Here is one devouring one of his fellows, a trifle weaker than himself; there two are struggling for the body of a third; all are darting about as if for dear life.

At Wood's Holl, the experiment of putting just 100 little lobsters into a vessel together was tried; at the end of 30 days, only one remained—the fittest had survived.

Other kinds of food have been given to them, but the very young lobsters thrive best upon each other; but for this reason it is unprofitable to keep them long in the aquarium where we have watched them. When they are not more than three days old, they are carried in water to the reefs along the Sound, where they can hide among the rocks and grow in comparative safety, feeding upon each other and what other animal food comes in their way.

Lobster hatching is all that is carried on during the summer, but during the winter and spring tomcods and smelts are hatched by precisely the same method, and are turned into the Sound while not much thicker than a thread. It is interesting to learn that the quantity of both these fish and the lobsters caught along this shore has greatly increased since the hatchery has been in operation. Whereas, at first, the spawn was all brought from a distance, now it is obtained right here in the harbor. This seems easily credible when we are told that during the past season 32,000,000 tomcod and 41,000,000 smelts were hatched.

The greater part of the ground floor of the hatchery is taken up by the 16 troughs, 24 feet long and about 15 inches wide, in which the trout and salmon are hatched. The supply of water is pumped from a spring-fed pond into a reservoir above the hatchery and flows in a constant stream through these troughs from the first of November, when trout hatching begins, until spring.

The piles of black objects on shelves against the walls are the trays upon which the spawn is placed. They are simply narrow wooden frames strung with very fine wires, so arranged that they hold the eggs; but the fish, as they escape from the shell, can slip between them into the water. When the hatchery is in full operation, these trays, each holding 10,000 eggs, are placed five deep all along the troughs.

The process of preparing the eggs for hatching is done artificially. The spawn is taken from the females in the ponds when the experienced hand knows that they are about ready to deposit it; at the same time the "milt" is taken from the males. The two are quickly and carefully mixed in a pail and in this way fully 90 per cent of the eggs are fertilized.

The spawn is then ready to be spread on the trays already described. Then begins the constant and painstaking work of the foreman and his three assistants. They are kept busy removing empty shells, dead eggs and the sediment which collects continually. This cleaning has to be done by the movement of a feather, so easily may the spawn be injured.

The shades at the windows have to be regulated by the sun, for strong light athwart a line of troughs may quickly drive the tiny fish so close together that they are smothered and may even kill the eggs upon which it falls. Sometimes a streak of dead eggs in