EXPERIMENTS WITH WATER JETS.

A jet of water thrown into the air seems at first sight to be a very simple affair, and one that would not repay a very close study. In fact, however, the water jet is governed by very complex and important laws, which are as yet not perfectly understood. In particular, the manner in which the solid stream breaks up into separate drops at a greater or less distance from the orifice is of especial interest.

A soap bubble, as is well known, consists of a mass of air inclosed by an envelope of soap and water. This envelope is elastic and in a state of tension—just like the rubber toy balloons. If a small opening is made in the balloon with a pin, the gas escapes and the covering collapses. So if we stop blowing into the soap bubble, and allow it to hang from the pipe, the elastic force of the walls of the bubble will force the air out through the stem, and the bubble will rapidly disappear. If we touch the outside of the bubble in such a way as to break the continuity of the film, the tension is so great that the entire bubble is destroyed, and the film of soap and water is converted into a fine spray.

Now a drop of water has a similar constitution to a soap bubble. The outside surface of the water is in a state of tension, and presses upon the interior with a small, but perfectly definite, force; and to this law of the surface tension of liquids are due some very interesting natural phenomena. The insects which walk on top of the water owe their power to keep afloat to the tension of the film of water at the surface. A needle or a steel pen may be made, with a little care, to float on water in the same way; while the remarkable spontaneous movements of camphor, when placed in clean water, are explained by the same law. It would, however, be necessary to go too deeply into this rather difficult subject to fully discuss it; and it is mentioned here only to show its connection with the experiments about to be described, which can be best understood by considering a jet of water as somewhat resembling an elongated, but solid, soap bubble, with the interior compressed by the tension of the surface film, and with a tendency to break up into separate drops, or bubbles, from the unequal force of this surface tension.

In Fig. 1 is represented a jet of water thrown into the air from a rubber tube furnished with a glass tip, the opening of which has a diameter of about a sixteenth of an inch. The force of the water is adjusted to throw the jet about three feet into the air. Under these conditions, at a little distance from the orifice of the tube the jet will break up into drops of various sizes, which scatter themselves irregularly in the air so as to cover a large surface where they fall. If we now bring a stick of electrified sealing wax near to the jet, its character immediately changes. The jet gathers itself together, and, instead of a scattered spray of irregular drops, it is transformed into a procession of drops, nearly equal in size and distance from each other, which fall with great regularity. The electric excitement appears to so affect the surface tension of the jet of water that its action is exerted more uniformly and regularly. A tuning fork placed on a sounding board and set into vibration near the jet produces a similar effect.

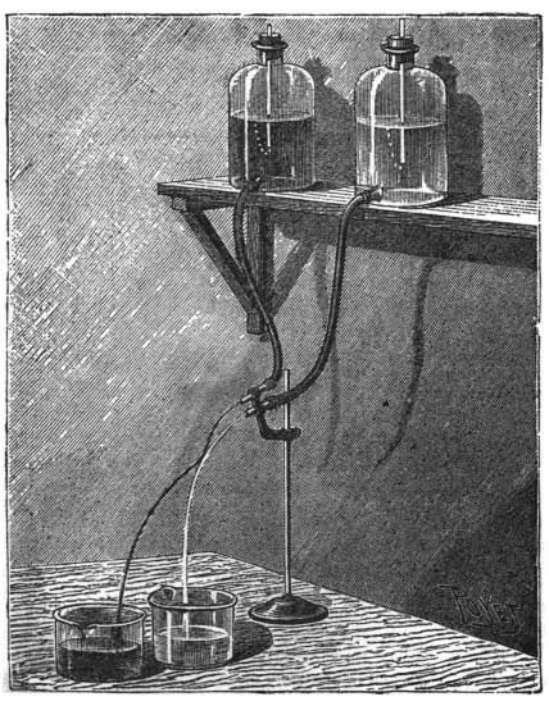

Fig. 2.—TWO WATER JETS WHICH DO NOT MIX.

A practical use is made of this action of electricity in the siphon recorders which receive the telegraphic messages sent over the ocean cables. The message is recorded upon a sheet of paper by means of a fine stream of ink discharged from a small tube, which is moved in different directions by the electric current. The ink in this tube is electrified by a separate apparatus, so that it is thrown on the paper in a fine, regular stream. In this way the tube, or pen, does not have to touch the paper at all, and all friction between paper and pen is avoided.

In Fig. 2 is illustrated an interesting experiment with liquid jets, which shows how, in some respects, they act like solid bodies. Two jets of water, one of which is colored with aniline, are arranged so that they strike each other at an acute angle. Under these circumstances they do not mix at all, but the colored

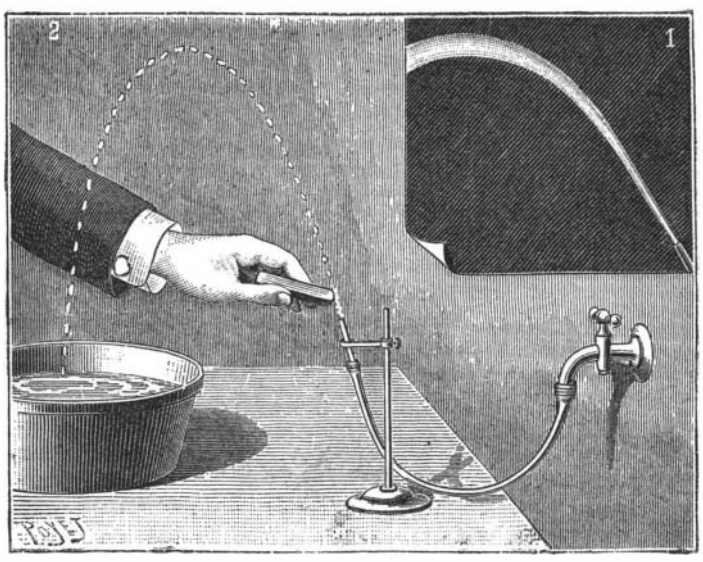

Fig. 1.—A WATER JET CHANGED BY ELECTRICITY.

water rebounds from the colorless stream and follows a perfectly distinct course. But if a piece of electrified sealing wax is brought near the two jets, they unite at once, and both streams mix together and follow an intermediate path to the ground.

The hydraulic microphone of Mr. Chichester Bell (Fig. 3) is another example of the sensitiveness of a liquid jet. If a fine jet of water is forced from a thin glass tube through an opening of about 1-75 of an inch, and allowed to strike the upper end of a glass tube of about half an inch in diameter, over which a piece of thin sheet rubber has been tightly stretched, no effect will at first be noticed; but if a watch be placed close to it, every beat of the escapement will affect the continuity of the jet of water, and each tick of the watch will be magnified and reproduced by the rubber and large tube so that it can be heard over a large room, like the taps on a drum.

In this connection we notice that in a communication to *Nature* (of London), Prof. W. B. Croft says: "A form of this effect lately presented itself which seemed in some ways new. A thin jet, five feet high and arched so as to be three feet at the base, was falling in a feathery spray. At thirteen feet distance a small Wimshurst machine was set going. Not instantly, but after two minutes, the spray gathered itself up almost into one clear line; although the jet was turned up and down and the machine was discharged, the falling water would not resolve itself again into spray for fifteen or twenty minutes. It is a striking illustration to help one to imagine what the electrical forces of the air may do. We can perhaps understand those thick, thundery rain drops that almost allow us to pass between them while they are giving friendly warning of what will come."

The accompanying engravings are reproduced from *La Nature.—Popular Science News.*

Tricks of Hindu Jugglers.

BY T. B. HOLMES.

The wonderful tricks of legerdemain, the feats of balancing, tumbling, and rope dancing performed by men and women in the theaters and circuses in this country are hardly equal to the commonest tricks and feats performed by Hindu jugglers in their native land.

It is a very common sight in India to see young girls balancing themselves on their heads with their heels in the air, or to see them walking on their hands and feet with their bodies bent backward. It is an easy thing for a girl of fifteen years to bend backward, plunge her head into a hole eighteen inches deep, full of water and dirt, and bring up between her lips a ring that was buried in the mud.

Women are not less dextrous than the girls and the men. They are frequently seen dancing in couples on slack ropes, one playing on the *vina* or Hindu guitar, while the other poses, postures, and capers gracefully about with a vessel brimful of water in each hand, without spilling a drop.

A Hindu juggler will stand a pole twenty feet high on the ground, and then climb to the top of it as if it was a firmly rooted tree. He fixes the top of the pole in the middle of his sash and dances about in all directions without disturbing the equilibrium of the pole. The same man, after giving an exhibition of this sort, slides down the pole, takes a boy on his shoulders, climbs once more to the top, fixes the top of the pole in the hollow of his foot, and stands erect, balancing himself, with the boy on his shoulder, as easily as the average person would balance himself on one foot on the ground.

Another very difficult act is that of balancing a sword with a broad blade, the point resting on the performer's chin; then the juggler will balance a straw on his nose, or on a small stick which he holds in his lips. While performing this trick the juggler sometimes places a piece of thin tile on his nose and tosses up a stone which, falling on the tile, breaks it in pieces.

Some of the most wonderful feats of these men are performed on the slack rope. While balancing himself on the rope, the performer carries a long stick on the end of his nose. At the top of the stick is set a large tray, from which walnut shells are suspended by threads. He takes in his lips a stick long enough to reach the shells, and by sudden movements of the lips he tosses each shell upon the tray without deranging anything or losing his balance. While doing this he strings beads upon a horse hair by means of his tongue, and without any assistance from his hands.

The Hindus have found means of communicating their great dexterity to domestic animals. They train bullocks to perform very difficult tasks. A Hindu juggler will lie down on his back and place a small piece of stout wood, 2 feet high and 6 inches in diameter, on the lower part of his stomach. At his command a trained bullock will set its four feet on the top of this stick and balance itself. The juggler will then place another piece of wood, similar to the first, a few inches from it, and the bullock will shift its position to it without touching its feet to the ground. Goats are also taught wonderful feats by this queer people.—*Christian Union.*

New Antiseptics.

Among new antiseptics from coal tar derivatives, says S. A. Walton, may be mentioned pyoktanin, methyl violet, the most antiseptic of the aniline colors. A solution of 1 in 1,000 is used in various eye diseases, phthisis, ulcers, etc. There is a yellow variety commonly known as auramine, also used antiseptically.

Lysol is a saponified phenol derived from cresols, and contains the higher homologues of carbolic acid. It is said to possess higher antimycotic power than carbolic acid, and to be less poisonous. This preparation is much used in Germany at the present time.

Retinol, a distillation product of pine resin, is a viscid fluid hydrocarbon. It is a non-irritating and stable antiseptic.

Europhen, iso-butyl-ortho-cresyl-iodide, contains 23 per cent of iodine, and is non-poisonous.

Dermatol, a basic gallate of bismuth, forms a powerful antiseptic and desiccant.

Sulphaminol, thio-oxydiphenylamine, the antiseptic action of which is due to its decomposition in contact with the fluids of the body into sulphur and phenol.

Fig. 3.—BELL'S HYDRAULIC MICROPHONE.

Monochlorphenol is prepared by the action of chlorine on cooled phenol. It is a powerful antiseptic and less irritating than trichlorophenol.

Camphoid, though only a mild antiseptic in itself, is a valuable adjunct to this class of bodies, as it forms a ready method of applying antiseptics to the surface of the skin, and owing to its composition (of spirit, camphor and pyroxylin) it forms a valuable solvent for substances such as salicylic acid, resorcin, hydronaphthol and many others.—*Chem. Tr. Jour.*