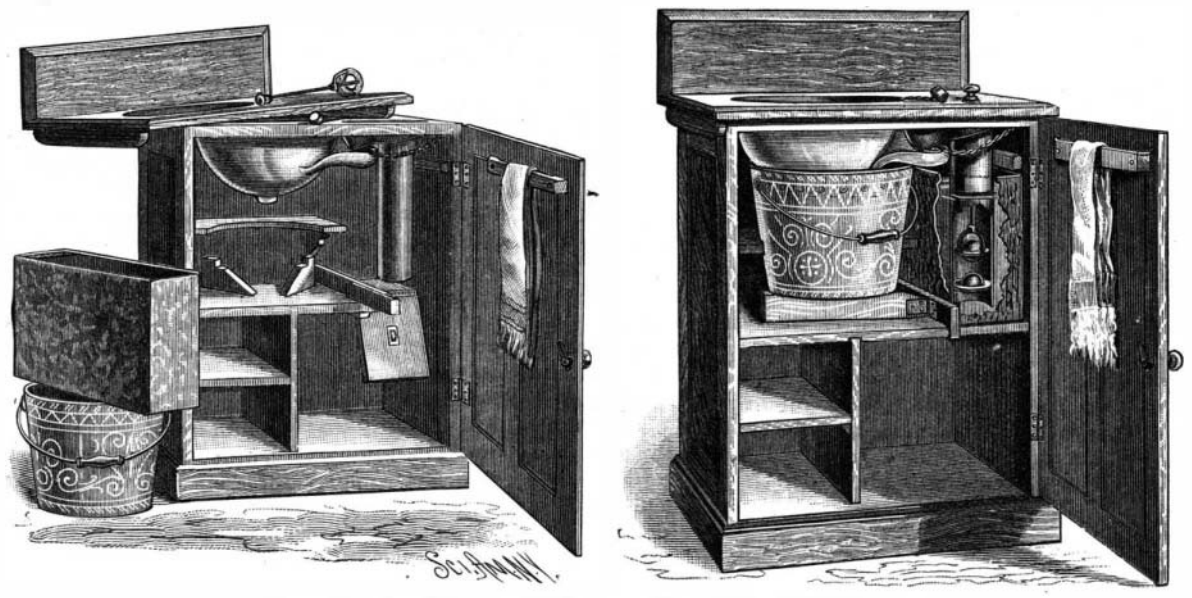
AN IMPROVED TOILET STAND.

In the patented toilet stand shown in the accompanying illustration, the fresh water is held in a reservoir beneath, and is pumped up and into the bowl over a projecting lip to the bowl beneath the slab. The pump is large, has no packing or closely fitting joints and the water is simply lifted in an easy, strong flow. The valves are rubber balls filled with shot and calculated to last many years, while they can readily and cheaply be replaced at any time. The fresh water reservoir is easily filled from time to time by simply pulling it forward, as a drawer, and replenishing from an ordinary nozzle spouted bucket. It can also be taken out entirely at any time to clean and air. The waste receptacle is an ordinary pail which sets up around and slightly above the lower portion of the bowl. Thus when full, or nearly full, it backs water up into the bowl and notifies the user. All danger of overflow, to which other such hidden sub-receptacles are incident, is thus avoided. The waste receptacle is securely held in place when in use, and is easily removed for emptying and cleansing by swinging open the little gate on which it rests in front and drawing it down and out. Every part of the stand is readily accessible and removable. The whole forms an extremely simple and economical arrangement, occupying but little space. The labor and breakage involved in lifting pitchers and bowls and spilling or splashing water into an exposed slop jar is avoided, and all the convenience and appearance of a stationary bowl is secured without the expense and the danger incident to the use of water and sewer pipe connections. This stand may be finished in any style and is susceptible of varied construction. For further information in regard thereto address Mr. H. C. Lowrie, Denver, Col.



A TOILET STAND FITTED WITH STATIONARY BOWL.

SPONTANEOUS MOTIONS OF BODIES ON THE SURFACE OF LIQUIDS.

Camphor, various odorous solids, and porous bodies saturated with volatile liquids, exhibit on the surface of water singular rotary and backward and forward motions, that attracted much attention from scientists during the first half of the present century. They have been attributed now to electricity, and now to simple mechanical phenomena of recoil, produced by the disengagement of vapors or fluid parts emanating from the substance and striking the air or water, but no definite solution, no clear and satisfactory explanation, of the phenomena has been given.

Dutrochet, the illustrious discoverer of endosmosis, after studies that were unfortunately vitiated by grave errors in the beginning (1841), but which were finally (1843) supported by experiments of a high value, found nothing to explain the movements under consideration but the hypothetical existence of an unknown force appearing at the surface of separation of any two liquids, and that he named epipolic force (from *ἐπιπολῆ*, a surface). This notion of a new force introduced into science was not accepted, yet, on the other hand, nothing was proposed as a substitute. To account for the movements of camphor, an effect of recoil, analogous to that of a skyrocket, was supposed, and yet this would not answer, for any one can see a very great disproportion between such cause of the motion and the motion itself.

Dutrochet guessed correctly when he conjectured that a special force must reside on the surface of liquids. To-day, in fact, it is everywhere recognized that such surface is the seat of a force which has been named superficial tension. As we shall need to know what this is, in order to understand what is to follow, we shall try to give a clear and simple idea of it.

Let us consider a soap bubble left to itself at the end of the tube that has served to inflate it. We see its volume rapidly diminish until it wholly disappears. At the opening, the air is expelled as if by an internal pressure, and produces an appreciable breath of wind. It is demonstrated in physics that the force that produces this pressure upon the air resides solely upon the free surfaces of the bubble, whether they be external or internal. These surfaces each act like a taut elastic membrane maintaining air under pressure. But it is not necessary to have a thin sheet of liquid with two free surfaces; a drop of water is, in fact, very much like a soap bubble, except that there is but one free surface, corresponding to the external surface of the bubble.

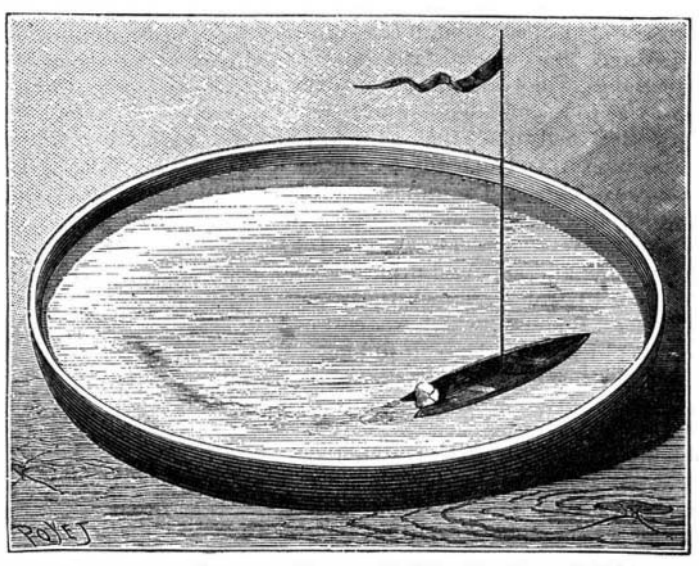


Fig. 1.—BOAT MOVED BY A FRAGMENT OF CAMPHOR.

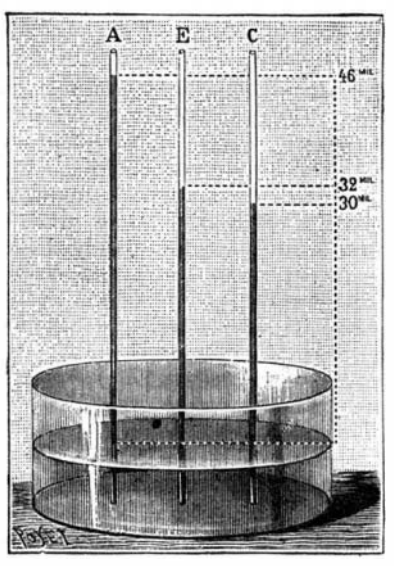


Fig. 2.
Levels to which water rises in a tube filled with air, A, vapors of ether, E, or vapors of camphor, C.

Finally, we might demonstrate that the free and plane surface of any liquid whatever is also the seat of a force that acts exactly as if the mass of liquid terminated in a very thin elastic and taut membrane. It has been found that it is to this force that are due the phenomena of capillarity, and perhaps many other less known ones. Let us say, even, to terminate these succinct notions, that this superficial tension of liquids is very probably only a peculiar case of attraction which is exerted between all bodies.

We know, then, that there constantly exists, at the surface of all liquids, a force that is at times powerful in its effects. But it is very remarkable that the intensity of this force changes with the nature of the liquid considered. We ascertain this by immersing the same capillary tube in various liquids, and observing the latter rise to different levels. It suffices, even, to pour a small quantity of any liquid upon water, to change the latter's superficial tension. This change is nearly always a diminution, on account of the very great tension of water at its surface, and which is greater than that of most liquids.

It was guided by these theoretical ideas that we were tempted to construct the little scientific toy shown in Fig. 1. It is a boat cut with scissors out of a thin sheet of tin, and hollowed out behind. When placed upon water, it readily floats. With a pipette, we place a drop of alcohol at the stern so as to touch the water, and we at once see the boat suddenly start off. At first sight, it really seems that a sudden and powerful repulsion occurs at the moment that the alcohol comes into contact with the water. But let us consider the facts from the standpoint of the tensions and tractions that the boat undergoes, when surrounded on every side by a liquid surface. In front, and at the sides, this surface is one of pure water, and, consequently, the seat of a strong tension. Behind, it is covered with alcohol, and this stratum, as thin as it is, renders the tension here notably less. Therefore, influenced by two contrary and unequal effects, the boat cedes to the more powerful, and is continuously carried along toward the free surface of the water.

There is, therefore, no need of invoking the existence of a repulsive force of unknown nature, for we know that there is an attractive force whose existence is certain, and which cannot remain without effect: the difference between a strong attraction, that of water, and a feeble one, that of alcohol. This fact is absolutely general. In fact, ether, chloroform, and oils produce a more or less rapid motion of the boat. Theoretically, most liquids might serve, on account of the strong tension residing on the surface of the water.

It might, doubtless, be thought that these effects occur only with quite a thick stratum of liquid on the water; but it is easy to demonstrate the contrary. An extremely tenuous stratum suffices to produce marked effects. Even vapors show these, and it is only necessary to suck air charged with them from bottles by means of a capillary tube and then insert the tube in water to see the level of the latter therein completely changed—lowered to a considerable degree (Fig. 2). Let us note

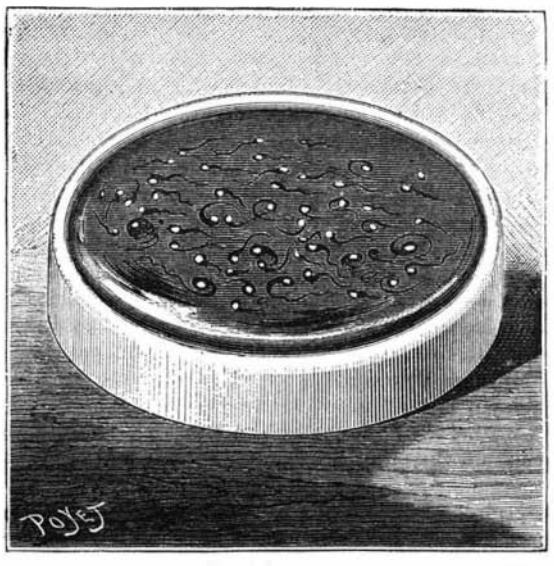


Fig. 3.—MOTIONS OF CAMPHOR ON THE SURFACE OF MERCURY.

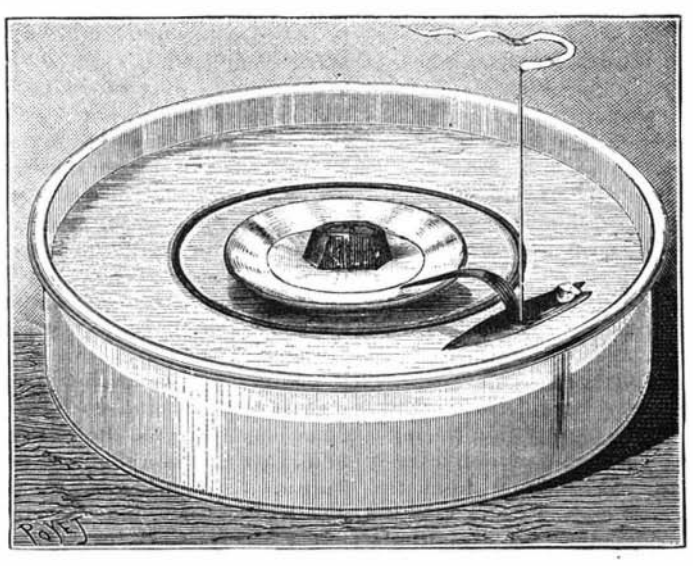


Fig. 4.—TIN BOAT CAUSING A LOADED FLOAT TO REVOLVE ON WATER.