Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year, postage included.................................$3 20

One copy, six months, postage included................................. 1 60

Club Rates.

Ten copies, one year, each $2 70, postage included.....................$27 00

Over ten copies, same rate each, postage included..................... 2 70

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VOLUME XXXIII., No. 21. [NEW SERIES.] *Thirtieth Year.*

NEW YORK, SATURDAY, NOVEMBER 20, 1875.

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SURFACE ADHESION.

The adhesion of surfaces is of much greater importance and of more general application, in the economy of Nature and in the production of a multitude of phenomena, than appears at first sight. It produces not only the friction between solids in contact (without which it would be very difficult, if not impossible, to attain any stability) but also the retention of liquids against the surface of solids, without which we would be unable to moisten or lubricate effectively any solid surface. This surface adhesion between a liquid and a solid of course increases with the increase of the surface of the solid, and the most direct illustration of this is the fact that, while, for instance, solid stones sink rapidly in water, when crushed they sink much more slowly, and this exactly in proportion as they are more finely divided: thus, while the stones in a river will sink even when the current is swift, the coarse sand will be carried along, and not sink unless the current is slow; while the very finest sand, notwithstanding it consists of the very same material as the stones, will not be deposited at all except where the water is at perfect rest. Hence the coarseness or fineness of the gravel in a river bottom depends on the speed of the current. The most striking illustration of this property is found in the process of elutriation, practised by chemists. It consists in grinding insoluble products with a little water to a thin paste, and then suddenly diffusing the paste through a large quantity of water in a deep vessel, from which, after the subsidence of the coarser portion, which at once takes place, the supernatant liquid is poured into another vessel and allowed to deposit the next fine parts held in suspension. After a time, say 15 or 20 minutes, it is again decanted, and the apparently clear water left to settle for several days, when a small quantity of the very finest impalpable powder is obtained. In the preparation of emery and other polishing powders of numerous grades of fineness, several vessels are employed; and the muddy liquid, first left to settle a short time, is poured in the second, left to settle a little longer, then poured in the third, and so on. The powder of this hard substance, last deposited, is in so minute a state of division as to possess very great value as a polishing agent.

Adhesion also exists between gases and the surfaces of liquids or solids, and is the origin of many phenomena, the sole cause of which must be looked for in this adhesion. If, for instance, there were no adhesion between the air and the surface of water, there would be no friction between them; and the wind would move freely over the surface of the ocean, and would be unable to raise waves. The proof of this is that, if we cover the surface of water with a film of a lighter liquid, like oil, having less adhesion to air, thus having friction less than that of water with air, the winds will glide over it without raising waves: hence the well known quieting influence of oil on the surface of water agitated by the boisterous winds; and use of this property has occasionally been made with good effect when oil was on hand. It is the same adhesion of air to solids which causes the dust to be raised by wind, notwithstanding that the particles of dust are much heavier than the air.

But the most important example of this force of surface adhesion is the power of the air to hold up fine particles of water in the form of clouds. To explain this apparently wonderful support of water in the atmosphere, so great a man as De Saussure had recourse to the absurd hypothesis that the water particles of which clouds and fogs consist were small hollow, vesicular spheres, like microscopic soap bubbles, with a vacuum inside, and therefore specifically lighter than the air. And microcopists even went so far as to investigate the vapor of hot water, to see if the ascending globular particles were hollow inside. Some of them even asserted that they found this to be so; but every one experienced in microscopic observations knows that it is next to impossible to decide if a very transparent globular object is hollow or solid, especially if it moves in the field of the instrument, as is the case with the particles of ascending vapors. In the light of our knowledge of adhesion, such an hypothesis is utterly unnecessary and uncalled for. We know that the dust of heavy solids, even of the metals, is carried by the air, as is proved by the microscopic observations of the dust collected from the roofs of the houses in any large city; why, then, cannot dust of water be carried upward, and remain suspended? If any one doubt the existence of such water dust, let him observe the spray of the Falls of Niagara, or other large falls, and see how it ascends. It is nothing but water ground to dust by the tremendous fall; and when the atmosphere is not dry enough to absorb it and make it disappear, it will rise to elevations of hundreds and thousands of feet, and form real clouds, which will float away with the others. The size of these particles determines the hight to which they will ascend; the finer will form the upper clouds, the coarser the low, floating fogs. Dr. Angus Smith recently recorded a fog which he observed in Iceland, of which the particles were larger than he ever saw before. It rolled low over the ground like a dust, and microscopic observation convinced him that the particles were not hollow but solid, and he found the diameter to be $\frac{1}{400}$ part of an inch. He also refers in his account to the absurdity of the vacuum hollow sphere theory, which only shows that the greatest inventor is liable to invent erroneous theories.

HOW SOME MOUNTAIN GAPS HAVE BEEN FORMED.

Every one who has visited the Delaware Water Gap, or ascended the Susquehanna from Harrisburg, or passed through the cut where the Potomac has pierced the Blue Ridge at Harper's Ferry, or has seen indeed any one of the numerous gaps made by seaward-flowing rivers through the long mountain ridges which flank the Alleghanies, must have been struck by the question how a comparatively small stream could overcome so formidable an obstruction.

Evidently the river could not have taken advantage of a natural cleft or fissure through the mountain dam, for the strata correspond on the opposing sides of the gap, and the river flows over an unbroken stratum under-running the broken strata of the banks. The gap as plainly denotes a section cut out of the mountain as a notch in a stick does the removal of the wood. The disconnected edges of the strata tell precisely the same story as the severed lines of annual growth on the sides of a wood chopper's cut: the connecting portions of wood and stone have been removed. The question is: How?

The first and most natural supposition would be that the valley, back of the dam, had originally been filled, forming a lake whose outlet was over the ridge above the present river channel: and that, as the outlet was lowered by the wearing down of the obstruction, the lake was drained until the entire valley was laid bare.

This supposition is negatived by the plain fact that it would be impossible to fill the valley to the hight of the ridge at the point of the gap. Before the water could reach that level it would find an outlet elsewhere, where the natural elevation of the dam was less. An excellent illustration occurs a few miles above Harrisburg, where the Susquehanna crosses a flexure of the mountain ridge, cutting twice through the mountains within a few miles, when apparently it might easily have avoided the obstruction by going a few miles around.

Another supposition is that originally the river ran at a level corresponding with the top of the ridge, and that the present valley through which it runs is the result of erosion: while the river was slowly wearing through the hard mountain strata, the softer earth of the surrounding country was washed away through its sinking channel, leaving the more unyielding rocks in mountain ridges. From this point of view, the river is to be regarded not merely as the cleaver of the mountain barrier but as the creator of it, by reducing the level of the adjacent land.

Hitherto this supposition has been the most plausible and the most generally accepted. But another and perhaps truer explanation is suggested in Professor Powell's "Exploration of the Cañons of the Colorado."

As our Atlantic rivers cut through the Alleghany ridges, so the Green River, the chief head stream of the Colorado, pierces the Uinta Mountains, flowing through a series of cañons compared with which our eastern water gaps are in significant. As in the case of the Susquehanna, above noted, the river bursts through the opposing mountains when apparently it might have found an easier passage by going round them. Why did it choose the harder course?

Professor Powell's answer is that it had the right of way. It was running there before the mountains were formed and simply removed the obstruction as fast as it rose in the way.

The contraction of the earth causes the strata near the surface to wrinkle or fold, and such a fold was started athwart the course of the stream now known as Green River. "Had the fold been suddenly formed, it would have been an obstruction sufficient to turn the water into a new course, to the east, beyond the extension of the wrinkle: but the emergence of the fold above the general surface of the country was little if any faster than the progress of the corrosion of the channel. We may say, then, that the river did not cut its way down through the mountains, from a hight of many thousand feet above its present site; but having an elevation, differing but little perhaps from what it now has, as the fold was lifted, it cleared away the obstruction by cutting a cañon, and the walls were thus elevated on either side. The river preserved its level, but the mountains were lifted up, as the saw revolves on a fixed point as the log through which it cuts is moved along. The river was the saw which cut the mountains in two."

The gigantic nature of this aqueous saw cut can be faintly estimated from the circumstance that the mountain log or fold had a diameter of fifty miles, while the depth of the cut, that is, the elevation of the fold above the present level of the river, was over twenty-four thousand feet. But a fraction of this enormous uplift of rock remains. As the rocks were lifted, rains fell upon them and gathered into streams, and the wash of the rains and the corrosion of the rivers cut the fold down almost as fast as it rose, so that the present altitude of the Uintas marks only the difference between the elevation and the denudation. The mountains were not thrust up as peaks, but a great block was slowly lifted, and from this the mountains were carved by the clouds—patient artists, who take what time may be necessary for their work."

THE WOODBURY PLANER WAR.

The manufacturers and users of the woodworking machinery on which the Woodbury Planer Patent Company are endeavoring to collect royalties, on the ground of an alleged infringement, will doubtless learn with gratification that at length the claims of the Woodbury people have been fairly brought before a United States Court. It will be remembered that a motion was granted some time ago in Washington, requiring the claimants to show cause why their patent should not be set aside on the ground of fraud. The time to appear was fixed for June 23, but an extension was granted until the middle of October; and from that period, it appears, still further time has been obtained, so that there is no immediate prospect of the matter being judicially determined from these proceedings. A suit has, however, been commenced by the Woodbury Company against Messrs. Stearns & Sons, large lumber dealers in Boston; and as this firm is resolute in refusing any compromise whatever, the cause at issue will in due process be reached.

Meanwhile the Woodbury Company seem to be resorting to all kinds of efforts to secure their tax. They have compromised with several users by giving licenses of a face value of $100 for $20 per machine; and one of their agents (or rather an individual named Allen, who claims to be such, and who has been endeavoring to frighten royalties out of small manufacturers in Massachusetts by representing himself as a United States Marshal, and acting otherwise fraudulently) has been locked up on criminal charges.

From 1,000 to 1,200 manufacturers and users of machines are now allied against the Woodbury monopoly, and the intention is to devote all possible energy to the breaking down of the claims of the latter by vigorously contesting the matter in the United States Court. The whole affair from beginning to end needs the searching scrutiny of a judicial examination. It began with Woodbury attempting to get a patent for a device which the courts had long previously decided to be an infringement on a prior patented invention. The Patent Office rejected his application in 1852, and thereupon woodworking people throughout the country adopted the pressure bar (intrinsically a most useful attachment) and used it, undisturbed, for eighteen years. In July, 1870, an act of Congress was passed, containing the following clause:

"That when an application for a patent has been rejected or withdrawn prior to the passage of this act, the applicant shall have six months from the date of such passage to renew his application or to file a new one; and if he omit to do either, his application shall be held to have been abandoned."

As a necessary consequence hundreds of old cases were revamped, including Woodbury's; but his application was again rejected. In January, 1873, another application met another rejection, and then, on April 26 of the same year, the Patent Office turned a complete somersault and declared all its previous decisions to be untenable and a tissue of blunders, and allowed the patent. The Commissioner, although the case was not in legitimate course before him, previously ordered that it be decided on its merits, without reference to abandonment, and gave instructions that no interference should be declared under the rule; and thereupon the patent was issued three days after its allowance, and two weeks ahead of the usual time.

When the act of Congress, containing the above quoted clause, was passed, we questioned its wisdom, and expressed the belief that it was framed more with a view to benefit some special case than to meet public exigencies. Certainly the facts relating to this Woodbury job point to the affirma-