METAL WILL FLOAT.

THE WATER STRONG ENOUGH TO SUPPORT IT, IF NOT TOO HEAVY.

PROF. ALFRED MAYER WRITES OF IT.

This is the First Time that the Theory to This Effect Has Been Proved—Experiments With a Metal Ring.

(Correspondence of the Dispatch.)

NEW YORK, July 24.—Professor Alfred M. Mayer, of the Stevens Institute of Technology, has proved the startling fact that metal floats on the surface of the water. There has been for years a theory to this effect, but never before has it been shown beyond cavil. Now, however, it has been proved that there is a film of air on the surface of the water sufficiently strong to hold upon its surface a piece of metal of considerable weight.

The conclusions reached by Professor Mayer were the result of continuous experiment, covering a series of years, and are all susceptible of proof that, Professor Mayer says, will convince any one. He has written for this paper a signed statement relating his views in the matter which will prove of exceeding interest, even to the lay world. It is as follows:

"It occurred to me that if a ring of metal with a chemically clean surface could be floated, and then gradually weighted until it broke through the surface of the liquid, one might thus measure surface tension. My experiment proved that not only was this true, but that needles and such objects could be made to keep upon the surface of the water with comparatively little effort. I was really astonished, for no matter how much a man may believe in a theory, it always astonishes him to hear that he is right, as he, like every one else, is always considering the difficulties, the obstacles which stand in his way.

"At the time of my first experiments I saw little prospect of succeeding in floating a ring with a clean surface, for all the treatises on physics I had read state that to float a metal on water its surface must be coated with a film of grease. A ring of aluminum seemed the more likely to float, because this metal has a peculiar repellent action on melted alloys, like ordinary solders. I made a ring of aluminum 50 millimetres in diameter out of wire 1 millimetre thick. It floated on water. As I gradually added weight to the ring it sank deeper and deeper in a depression in the water, till, having reached a depth of 5 millimetres, it broke through the water-surface. The total weight required to make the ring break through the surface was 3.6 grammes.

"In subsequent experiments I floated a ring of 61.8 millimetres in diameter made of aluminum rod 3.7 millimetres in diameter. This ring weighed 5.8 grammes. To float this ring requires a steady hand and patience; but a ring made of aluminum rod 3.15 millimetres in diameter is easily floated. With this ring may be made an interesting experiment. A ring with fine wire yoke and cup weighs 4.435 grammes. One gramme added to the ring causes it to sink, giving 5.435 as the breaking weight. The unloaded ring, therefore, weighs 19 per cent. less than the breaking weight. If, from any cause, such as the gathering of dust on the water, or the contamination of its surface from the vessel holding it, the surface tension should be weakened 19 per cent., then the unloaded ring will sink. This weakening of the surface tension is readily and rapidly brought about by pouring vapor of ether on the water. When this vapor reaches the water the ring moves to and fro in a tremulous manner, and then sinks.

"In my ignorance, I saw in these experiments a property of flotation peculiar to aluminum. Experiment, however, soon showed me that all metals, with clean surfaces, from platinum of a density of 1.7, float on water. When and with whom originated the erroneous statement that metals to float must have their surfaces greased I have not been able to discover; but this error has been copied from one treatise on physics into another for about a century.

ON DISTILLED WATER.

"If the platinum ring be loaded to, say, one tenth of the weight required to make it sink and then floated on freshly distilled water, it will sink when, from any cause, the surface tension of the water has been lessened 10 per cent. The duration of flotation of the ring is variable. On one day it floated only during two hours; on another day it floated for nine hours; on another day five hours. The same ring loaded so that it lacked 20 per cent. of the breaking weight floated during sixty-six hours. The contamination of the water seemed more rapid during dry, windy, and dusty weather, than during, or just after a rain. The contamination, however, also proceeds from the vessel, either of glass or of metal, holding the water, as shown by Miss Agnes Pockels, of Brunswick, Germany. I have not given any study to the causes of the contamination of a surface of water exposed in the open air, because the results with the ring, though curious, are of little value unless connected with other observations on the conditions of the atmosphere. It may that a floating platinum ring may be of use in determining the relative amounts of dirt or dust in the air on different days; but to be used for this purpose one must first accurately find out how much of the contamination is due to the substance of the vessel by experiments made on water in the trough of Miss Pockel's enclosed in an air-tight vessel.

"Several pleasing experiments may be made with the platinum ring floated on water in the trough devised by Miss Pockels. This ingenious and simple invention consists of a trough of tinned iron 70 centimetres long, 5 centimetres wide, and 2 centimetres deep, filled to its brim with water. A strip of metal longer than the width of the trough is placed athwart the latter, with the plane of the strip in a vertical position. The lower edge of the strip touches the surface of the water. By sliding the strip from the extreme end of the trough, the contaminated surface of the water is made smaller and more contaminated, on the side of the strip towards which this is moving, while the surface of the water on the other side of the strip has been swept clean, and may be regarded as a clean surface. The platinum ring is floated on this clean surface, and the weight required to sink the ring is determined. Now load the ring till its weight is less than the weight required to sink it by 10, 20, 30, etc., per cent. If the ring is now floated near one end of the trough, while the strip of metal is slid along from the other end of the trough towards the ring, the surface of the water on the side of the strip toward the ring becomes more and more contaminated till its surface tension can no longer hold up the ring, and this sinks. Knowing the percentage of the breaking weight with which the ring is loaded, and the fraction of the length of the trough to which the strip has been moved when the ring sank, we have the degree of contamination of the water of the trough before it was altered by the sliding strip.

"There is no difficulty in obtaining a contamination surface. The surface of distilled water is contaminated soon after it has been poured into the trough; and no doubt was contaminated before it was poured from the bottle. If, however, a greater degree of contamination of surface is required, it may be obtained by introducing into the water the point of a needle which has been coated with a thin film of oil, or, by keeping camphor over the surface of the water. A very thin film of oil, whose thickness Lord Rayleigh has fixed as equal to 1 1-2 millionth of a millimetre, or 1-800 of the length of a wave of yellow light, is sufficient to stop the motions of minute, thin scraplings of camphor. If the motions of the camphor, however, continue with the degree of contamination we have given the water, we can stop these motions by increasing the contamination on sliding the metal strip along the trough and contracting the contaminated surface. If the ring floating on this portion of the liquid is now loaded till it sinks, we have the means of knowing the diminution of the surface tension required to stop the motions of the camphor.

A LOWER TENSION.

"If the ring is placed near one end of the trough and the strip of metal is slid from the extreme of the trough towards the ring, but not near enough to it to cause such lowering of surface tension that the ring sinks, one will observe the ring to move slightly away from the moving strip. This is owing to the contamination of the surface being slightly greater, and the surface tension lower near the side of the strip toward the ring than it is at a distance from the strip near to and beyond the floating ring. The consequence is that the surface film surrounding the ring and beyond it contracts and carries the ring away from the strip. The strip now remaining stationary, we have a lower tension on the contaminated or ring side of the strip than on the other side, where the surface of the water is clean; therefore, on sliding the strip backwards with a gradually increasing velocity over this clean surface, or on removing the strip from the trough, the clean surface contracts and keeps on contracting till it has so stretched the contaminated surface that it covers uniformly the whole surface of the trough. The ring, hung in this surface which is being stretched, moves with it, and is seen to go rapidly towards the other end of the trough.

"If platinum, gold, or silver wire of 4-10 millimetre in diameter is formed into a ring, heated to redness, and when cold placed on water, it sinks. If the ring is wiped dry and then placed on the water it sinks, but if wiped dry and exposed to the air for from ten to fifteen minutes it will float. Also, a ring of one of these metals which has been heated to redness, and which has not been wetted, will float after having been exposed to the air for about half an hour.

"Wires of platinum, gold, and of silver of 4-10 millimetre in diameter, and wires of aluminum, copper, brass, and German silver of 1 millimetre in diameter floated when gently placed on the surface of water by means of a fork made of fine wire. These wires were five centimetres long. All of these wires sank after having been passed slowly to and fro six times in the lower part of a spirit flame, and recovered their property of flotation after they had remained from two to five minutes in the air.

"Glass rods of 1-2 millimetre diameter and 5 centimetres long behaved in similar manner to the wires. If a rod of glass recently drawn out in a spirit flame and just cold is placed on water it sinks. After a freshly-made glass rod has remained exposed to the air for about fifteen minutes it will float. If a recently-made glass rod which has just sunk in water be withdrawn, wiped dry, and exposed to the air for from ten to fifteen minutes, it will float. These floating-glass rods, however, do not, as in the case of the wires, give straight lines of demarkation between the surfaces of the glass and the water. At some places the water wets and covers the glass; at others it does not wet the glass, and the lines of demarkation of the glass and water are jagged. This rod, placed vertically in the water, shows an ascending meniscus at the parts where it was wetted when floating and a depressed meniscus at the parts where it repelled the water. If a glass rod is sunk and then brought to the surface of the water and floated and this operation repeated several times, the rod becomes more and more repellant of water, and when depressed in the water-surface by a fine wire the lines of separation of the glass and water become almost straight and the rod acts like one of clean metal. The rod can now be depressed, by a fork of fine wire, to nearly three millimetres below the general level of the water. These experiments show how soon the surface of glass is contaminated by exposure to water and air, this contamination reversing, indeed, the attractive property of clean glass for water.

"The experiments on the metals show that when their surfaces are freed of air they sink, and that after the film of air has recondensed on their surfaces they float. In other words, in the first case the metals are wetted, and in the second they are not. It is evident that the dry surface of the wire between the two opposite depressed surfaces of water could not exist if the water wetted the wire as it would wet a ring made of clean glass. At the same time, though the water does not wet the wire as water wets glass, yet the water is attracted by the wire so that it adheres to it with such force that it can take the curvature required to withstand the inward hydrostatic pressure on the two depressed water surfaces. Another observation is of interest here. On observing the wire between the depressed sheets of water through a microscope, one does not see the opposite surfaces of the water gradually and smoothly slide over the wire and approach one another as the wire goes deeper and deeper in the depression, but the terminal edges of the depressed water surfaces leave the wire to approach one another in a series of jumps. These releases of the two edges of the water surfaces from the wire do not take place uniformly and simultaneously along the whole of these edges, but take place at many points irregularly distributed along the lines of demarkation of the wire and water.

"The attraction existing between the wire and the water is shown by lifting a boating ring above the general surface of the water when the water adheres to the ring, and may be lifted several millimetres. If the ring be lifted quickly we often obtain a catenoid of elevated water-film apparently a centimetre or more in height. When the elevated film breaks it generally forms into drops regularly spaced around the ring.

"The film of air on the surfaces of the rings must be very thin, probably a small fraction of the radius of molecular activity. If, however, the air be condensed on the metals to the same degree that oxygen is occluded by platinum black, the air-film may have the density of water, and its attraction may be of an order approaching that of the metal itself for water. This condition, which probably exists, renders futile the determination of the thickness of the air-film by optical methods. Professor Wright, of Yale University, suggested to me to determine if total reflection took place from a water surface which was in contact with a surface of metal. I made the experiment in the following manner: A cubical vessel made of plates of glass, was about two thirds filled with water, and a black cross on a white ground was seen by total reflection from the surface of the water. A floating disc of aluminum was moved till it came over the portion of the water from which the reflection had taken place. The reflection was destroyed by the presence of the disc, and this destruction took place either with a disc whose surface was partly polished or with a disc whose under-surface had been made of non-reflecting gray by the action of caustic soda. This fact is interesting, but I do not see how it can give information even as to the limiting thickness of the film of air of whose condensation and index of refraction we know positively nothing.

"ALFRED M. MAYER."

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Remove the Cause and the Result Will Cease to Follow.

(Lawrenceville Gazette.)

The fact that in the city of Richmond, with a population of 100,000, and in the broad light of day, two deperate attempts at criminal assault have been made upon ladies by a negro man within the past week, and the frequency of such crimes throughout the South, go very far to emphasize the difference in moral status between the negro as a slave and as a freeman, and show that freedom and the educational and religious advantages that have accompanied it have served but a poor purpose, so far as a large element of the race is concerned, in elevating their moral character and curbing the brutal instincts of their natures. In the ante-bellum days, when the negroes were held as slaves, crimes of this character were of the rarest occurrence—almost unheard of—and we believe if correct data could be obtained it would show that few of the criminal assaults upon white women have been made by the negroes who were reared under the wholesome and restraining influence of a master, but by those of the post-bellum class, who have been taught that freedom means immunity from labor and license to disregard the law and to gratify the animal lusts. For the misdeeds of the miserable wretches who have figured in these outrages we should not make a wholesale condemnation of the race, and class them all in the same category. There is a very large element of the negro population who have a proper appreciation of the new relations their emancipation created, and who honestly endeavor to avail themselves of the benefits they have afforded to raise themselves in the social and moral scale. That phenomenal success has crowned the efforts of this class statistics fully warrant us in believing. They have proved true to themselves, and have made the best use of their opportunities. They have been guilty of no great sin of commission, but are chargeable with one of the gravest omission is not raising their voice in the sternest condemnation of a crime that almost invariably leads to lawlessness, and which is daily destroying the friendly relations that should and would otherwise exist between the races. If the more respectable and intelligent class of negroes, their preachers and teachers, would only exhibit one-half the earnestness and zeal they display in denouncing lynching and lynch law in denunciation of the one crime that induces the white men wherever it is committed to take the law into their own hands, they would be doing God's service, and at the same time might save the country from such exhibitions as nearly always follow in the wake of its commission. As long as the negroes exhaust all of their efforts in denouncing lynching and take no notice of the crime that leads to it, but rather make martyrs and heroes of the wretches who commit it, they may reasonably expect that it will become more frequent, and that the lawlessness of which they affect such horror will increase pari-passu. The negro might as well be made to understand that whenever a white woman is criminally assaulted by one of his race, that speedy punishment will surely follow, not according to the form prescribed by the law, but in the mode that may be dictated by outraged public sentiment, which in all such cases is a law unto itself, and that invectives and denunciation will avail nothing to avert it. Let them put a stop to the crime and there will be no occasion for them to lament lynching.

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Original and Only Genuine. SAFE, always reliable. LADIES ask Druggist for Chi-ches-ter s English Diamond Brand in Red and Gold metallic boxes, sealed with blue ribbon. Take no other. Refuse dangerous substitutions and imitations. At Druggists, or send 4c. in stamps for particulars, testimonials and "Relief for Ladies," in letter, by return Mail. 10,000 Testimonials. Name Paper. Chichester Chemical Co., Madison Square, PHILADA., PA. Sold by all Local Druggists.

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DEPARTURE OF STEAMERS.

OLD DOMINION STEAMSHIP COMPANY.

DAILY LINE FOR NEW YORK.

Passengers can leave Richmond DAILY via Chesapeake and Ohio railway at 3:35 P. M., or Richmond and Petersburg railroad (Norfolk and Western route) 9 A. M., connecting at Norfolk with Old Dominion-Line steamer, sailing same evening for New York.

ALL-WATER ROUTE.

Steamship Old Dominion leaves Richmond every Monday at 5 P. M. for New York via James river.

Tickets on sale at Richmond Transfer Company's, 903 east Main street; Chesapeake and Ohio railway, and Richmond and Petersburg railroad depots, and at company's office, 1212 east Main street, Richmond. Baggage checked through.

FREIGHT

for New York and all points beyond can be shipped by direct steamers, sailing from Richmond every MONDAY AND FRIDAY, 5 P. M.; also, by steamer leaving Richmond WEDNESDAY, 5 P. M., for Norfolk; connecting with steamer for New York.

Manifest closed one hour before sailing time.

Freight received and forwarded and through bills of lading issued for all northern, eastern, and foreign points.

FROM NEW YORK.

Passengers can leave daily, except Sunday, to Norfolk or Old Point Comfort, connecting with Norfolk and Western railroad or Chesapeake and Ohio railway.

Direct steamers (via James-river route) leave every SATURDAY (passenger and freight), and TUESDAY (freight only).

Sailing from company's pier, No. 26 North river, foot of Beach street, at 3 P. M.; Saturday, 4 P. M.

Freight received and forwarded daily, except Sunday.

For further information apply to

JOHN F. MAYER, Agent,
1212 east Main street,
Richmond, Va.

W. L. Guillaudeu, Vice-President and Traffic Manager, New York. fr 10

RAILROAD LINES

R., F. & P. Richmond, Fredericksburg & Potomac.

Schedule in Effect April 15, 1897.

LEAVE BYRD-STREET STATION.

8:20 A. M., Sunday only, for Washington and points North. Stops at Elba, Glen Allen, Ashland, Doswell, Ruther Glen, Penola, Milford, Guinea, Fredericksburg, Brooke, and Widewater.

8:45 A. M., Daily, except Sunday, for Washington and points North. Stops at Elba, Ashland, Taylorsville, Doswell, Ruther Glen, Penola, Milford, Woodslane, Guinea, Summit, Fredericksburg, Brooke, and Widewater. Pullman car.

12:00 M., Daily except Sunday, for Washington and points North. Stops at Elba, Glen Allen, Ashland, Doswell, Milford, Fredericksburg, Brooke, and Widewater. Parlor-car. Also, connects with Congressional Limited at Washington

7:15 P. M., Daily, for Washington and points North. Stops at Elba, Ashland, Doswell, Milford, Fredericksburg, Brooke, and Widewater, and other stations Sundays. Sleeper, Richmond to New York.

ARRIVE BYRD-STREET STATION.

8:40 A. M., Daily. Stops at Widewater, Brooke, Fredericksburg, Milford, Doswell, Ashland, and Elba, and other stations Sundays. Sleeper, New York to Richmond.

2:45 P. M., Daily, except Sunday. Stops at Widewater, Brooke, Fredericksburg, Summit, Guinea, Woodslane, Milford, Penola, Ruther Glen, Doswell, Taylorsville, Ashland, Glen Allen, and Elba. Parlor-car from Washington.

7:10 P. M., Daily. Stops only at Fredericksburg, Doswell, and Ashland. Pullman cars from New York and Washington.

8:36 P. M., Daily. Stops at Widewater, Brooke, Fredericksburg, Summit, Guinea, Woodslane, Milford, Penola, Ruther Glen, Doswell, Ashland, Glen Allen, and Elba. Sleeping-car.

FREDERICKSB'G ACCOMMODATION.

(Daily except Sunday.)

4:00 P. M., Leaves Byrd-Street Station.
8:30 A. M., Arrives Byrd-Street Station.

ASHLAND TRAINS.

(Daily except Sunday.)

6:42 A. M., Leaves Elba.
6:20 P. M., Leaves Elba.
6:40 A. M., Arrives Elba.
6:00 P. M., Arrives Elba.

C. A. TAYLOR, Traffic Manager.
E. T. D. MYERS, President. je 2

N. & W. Norfolk and Western Railway.

Schedule in Effect July 4, 1897.

LEAVE RICHMOND, BYRD-STREET STATION.

9:00 A. M., Daily—Richmond and Norfolk VESTIBULE LIMITED. Second-class tickets not accepted on this train.

9:05 A. M., Daily, "THE CHICAGO EXPRESS," for Lynchburg, Roanoke, Columbus, and Chicago. Pullman Sleeper Roanoke to Columbus; also, for Radford, Bristol, Knoxville, Chattanooga, and intermediate points.

7:30 P. M., Daily, for Norfolk, Suffolk, and Intermediate stations.

11:50 P. M., Daily, for Lynchburg and Roanoke. Connects at Roanoke with Washington and Chattanooga Limited. Pullman Sleepers Roanoke to Memphis and New Orleans.

PULLMAN SLEEPER between RICHMOND AND LYNCHBURG ready for occupancy at 9 P. M.; also, Pullman Sleeper Petersburg to Roanoke.

Trains arrive Richmond from Lynchburg and the West daily 8:15 A. M. and 8:56 P. M. From Norfolk and the East 11:05 A. M., and Vestibuled Limited 7 P. M. Office: 828 Main street.

R. W. COURTNEY,
District Passenger Agent;
W. B. BEVILL,
General Passenger Agent.
General Offices: Roanoke, Va. je 2

CHESAPEAKE AND OHIO RAILWAY.

Effective July 5, 1897.

TRAINS LEAVE RICHMOND, BROAD-STREET STATION.

8:50 A. M., Daily, with Parlor car, for Norfolk, Portsmouth, Old Point, Newport News, and local stations.

3:35 P. M., Daily, with Pullman, for local stations, Newport News, Old Point, Norfolk, and Portsmouth. Connects daily with Old Dominion steamship for New York.

10:20 A. M., Local train, with parlor-car, except Sunday, for Ronceverte. Connects at Gordonsville for Orange, Culpeper, Calverton, Manassas, Alexandria, and Washington; at Union Station, Charlottesville, for Lynchburg; at Basic for Hagerstown.

2:15 P. M., Daily, with Pullmans to Cincinnati, Louisville, and St. Louis. Stops only at important stations. Connects at Covington daily for Virginia Hot Springs. Meals served on Dining-cars. No. 7, Local Train, except Sunday, follows above train from Gordonsville to Goshen.

5:30 P. M., Accommodation, except Sunday for Charlottesville.

10:30 P. M., Daily for Cincinnati, with F. F. V. Pullmans to Hinton, W. Va., and Gordonsville to Cincinnati and Louisville. Meals served on dining-cars. Connects at Staunton, except Sunday, for Winchester, Va., and at Covington, Va., daily, for Hot Springs.

TRAINS LEAVE EIGHTH-STREET STATION.

8:50 A. M., Daily, for Lynchburg and Clifton Forge. Connects at Eremo, except Sunday, for Rosney; at Lynchburg, daily, with Norfolk and Western railroad, and the Southern railway for the Southwest and South; except Sunday, at Balcony for Lexington, at Bessemer for New Castle, and at W. Clifton Forge with No. 1 for Cincinnati.

5:00 P. M., Except Sunday. Local accommodation for Gladstone.

TRAINS ARRIVE AT RICHMOND, BROAD-STREET STATION.

8:20 A. M., Daily, from Cincinnati.
10:00 A. M., Mondays only, from Waynesboro'.
10:15 A. M., Daily, from Norfolk and Old Point.
3:30 P. M., Daily, from Cincinnati and Louisville.
6:50 P. M., Daily, from Norfolk and Old Point.
7:30 P. M., Except Sunday, from Ronceverte.

TRAINS ARRIVE EIGHTH-STREET STATION.

8:40 A. M., Except Sunday, from Gladstone.
6:40 P. M., Daily, from Lynchburg and Clifton Forge, and, except Sunday, from Lexington, New Castle, and Rosney.

JOHN D. POTTS,
Assistant General Passenger Agent.

DEPARTURE OF STEAMERS.

BAY LINE. JAMES-RIVER ROUTE FOR BALTIMORE.

CLOSE CONNECTION FOR ALL POINTS NORTH.

Appointed sailing days, every TUESDAY, THURSDAY, AND SATURDAY at 3 P. M.

Freight received daily until 5 P. M.

Elegant state-rooms, heated by steam and lighted by electricity.

For tickets, state-room reservations, and further information, apply to

H. M. BOYKIN,
General Agent,
836 east Main street.
fe 3

PHILADELPHIA, RICHMOND AND NORFOLK STEAMSHIP COMPANY.

Appointed sailing days: Every TUESDAY, FRIDAY, and SUNDAY at daylight.

Freight received daily until 5 P. M.

Fare (including meals and berth), $5 on Friday's and Sunday's steamer.

For further information apply to

J. W. M'CARRICK,
General Southern Agent; office Rocketts.
W. P. CLYDE & CO.,
General Agents, Philadelphia.

RAILROAD LINES.