

circumstances. The shell of the sphere comes, as shown in the engraving, just to the edge of the mirror, but has nothing to do with its support, the braces being solely for this purpose. The secondary mirror is held by two stays, which extend from the circumference of the reflector and meet at a calculated distance from the same. It is not necessary that the reflector be placed at the surface of the globe, but it may be placed at or near the center, leaving an opening of the same size in the globe, with perpendicular sides, thus requiring little or no counterpoise. The standards and stays holding the small mirror may be attached to the extreme external surface of the globe, thus giving a larger base and greater steadiness. The stays toward the poles are so arranged that the lower one is detached when nearing the horizon, in case it should be desirable. By this method there is nothing, as far as we can now see, to prevent the successful constructing and using of a telescope of very large size.

Through the center of the large glass is made an opening, and in this is a telescope tube, suitably jointed and terminating in an eyepiece within the globe at the observer's seat. The situation of the latter is clearly shown in the illustration, and it is suitably supported so as to be always vertical. By this arrangement the observer is constantly located in the right position; and by placing a partition of some non-conducting material between him and the backing of the reflector, so as to leave an intermediate space of four or five inches, a warm room to work in may be gained, and a means of keeping the braces dry provided.

The great sphere pivots in a ring, the axis of which is inclined to point to the pole, and is pivoted at one side in the cap of a single heavy pier. Below the globe is a vault filled with water or other liquid, in which it floats and from which it receives its principal support. It is evident that the motion of the apparatus will thus be susceptible of easy regulation, and may be effected by simple mechanical appliances arranged with counterpoises and governed by the observer. As our object is not to enter into the minor details of this plan, but rather to exhibit the idea upon which it is based, further explanation is deemed unnecessary.

The inventor thinks that a mirror of fifteen feet diameter may be constructed and mounted as we have described. As compared with a refracting telescope with an objective of corresponding size, and a focal length of 200 feet, the refractor would give a sun picture 20 inches in diameter; the reflector, having 100 feet focal length, would show an image 10 inches in similar dimension. In point of quantity of light, compared with Herschel's reflector, which was nearly five feet in diameter, the focal distance being still 100 feet, a 15 foot mirror would gather nearly 14 times as much. For photography, a great reflecting telescope could not be advantageously employed, as it would fail to give sufficiently fine definition of the object; but for spectroscopic work, it would be very useful and especially valuable for heat investigations with the thermopile. As a searcher for faint comets and double stars, from the large amount of light received, it would lead to results of great importance, and enable us to examine and resolve nebulae before which the highest magnifying power now existing fails.

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(Illustrated articles are marked with an asterisk.)

Table listing various articles and their page numbers, including 'Answers to correspondents', 'Attraction of the earth and the sun', 'Brain impressions and the memory', etc.

LAKE TITICACA.

This is the most singular and interesting lake in the world. Situated on the crest of the Andes, it is the highest large body of fresh water; and as concurrent traditions point to it as the spot where Manco Capac, the first Inca, appeared and woke the aboriginal tribes from their long sleep of barbarism and ignorance, it is the historic center of South America. Humboldt called it the theater of the earliest American civilization. On an island within it are the imposing ruins of the Temple of the Sun, and all around it are

monuments which attest the skill and magnificence of the Incas. There are also, as at Tiahuanaco and Silustani, the remains of burial towers and palaces, which antedate the crusades, and are therefore pre-incarial.

Lake Titicaca is about the size of our Ontario, shallow on the west and north, deep towards the east and south. The eastern or Bolivian shore, being backed by the lofty range of Sorata, is very high and precipitous. The lake never freezes over, although the temperature of Puno is often 18° at sunrise. Two little steamers of 100 tons each do a trifling business. Steam is generated by llama dung, the only fuel of the country; for there are no trees within 150 miles. The steamers actually cost their weight in silver; for their transportation (in pieces) from the coast costs as much as the original price. A steamboat company has just asked from Bolivia the exclusive privilege of navigating Titicaca and the Rio Desaguadero to Lago Pampa, with a guaranty of six per cent cost on the capital and a share in all new mines discovered.

Professor Orton, the latest traveler in that region, calls attention to the fact that Lake Titicaca is not so high as usually given in geographical works by about 300 feet. Its true attribute is 12,493 feet, and in the dry season it is four feet less. This fact has been revealed by the consecutive levelings made in building the Arequipa railway just finished, which reaches from the Pacific to Lake Titicaca. The road rises from the sea to Arequipa, 7,550 feet; thence to the summit, 14,660 feet; and then descends over 2,000 feet, to Puno on the west shore of the lake, a distance by the track of 325 miles from the ocean. Pentland's estimates of Sorata, Illimani, and other peaks of the Andes, having started from the Titicaca level as a base line, must come down full 300 feet.

SWINDLING PATENT SELLERS.

We have received of late a great number of letters calling our attention to the rapid growth and extension of the frauds perpetrated upon inventors by inducing the latter to forward sums of money, as pretended fees, to certain agents who pretend to sell patent rights. Some time ago, we had occasion to show up these knaves, and warned our readers to beware of them, mentioning an instance of some scamps in the West receiving not only money but models, the latter of which they either left in the express office or behind them in a loft when they decamped from the town, while they, of course, applied the funds to their own benefit. We are led once more to revert to the subject by the reception of several queries regarding a "Mississippi Valley Manufacturing Company," doing business in Vicksburgh, Miss. One correspondent, among the many, favors us with a copy of the letter received by him, which reads as follows:

(Handsome letter head of buildings, etc.)

Mississippi Valley Manufacturing Co. January 13, 1874.

Mr. _____

Dear Sir:—Will you, upon receipt of \$1,200 cash, allow us to have your coupling for gas and water mains manufactured to supply the trade of the South and West, for the term of two years upon a royalty of \$5.00 per dozen made? If you desire to dispose of your invention in this manner, send \$5.00 to pay part of the attorney's fees for examining title, etc. Upon receipt of same, we will make the necessary inquiries at the Patent Office, and also have your invention examined before a board of competent judges, when, if everything proves perfectly satisfactory, we will remit the amount by draft on any bank you name, the same to be subject to your order upon the receipt by us of the necessary transfer. Our arrangement will not prevent you from selling any State you may receive offers for. Comply at once with our terms, if you wish us to take hold of it. Yours truly,

MISS. MANUFACTURING CO.

This swindle is so very palpable that one is almost at a loss to understand how any person can be so foolish as to be deceived by it; and yet another correspondent, who has interviewed an official at Vicksburgh regarding the subject, says that large numbers of letters are constantly sent to the above address. Inquiries, made as to the business location of the recipients of these missives, revealed a little room in a "decayed part of the city," the whole contents of which would not exceed twenty dollars in value. The parties are young men who are leading a fast and dissolute life on the money thus fraudulently obtained. The inventor rarely receives an answer to his letter enclosing the funds. The Vicksburgh Herald has also investigated the matter, and remarks: "We have only to say, for the protection of people everywhere, that we have never heard of any such company, and that it exists only in the imagination of the swindlers who are trying to defraud the public." So much for the Mississippi Valley Manufacturing Company. Still another correspondent asks for information concerning the Western Michigan Patent Agency, Grand Rapids, Mich. This very enterprising firm wants only ten dollars and a model, to make the inventor rich. The writers ask if these gentry are related to the scoundrels who were located in Albion, Mich., some time since, and who flourished under another name.

It is curious to note with what alacrity people will risk good money for the chances of a large profit. The same feeling which induces the ignorant to stake funds in lotteries, where the probabilities are all against them, impels others to transmit their cash to persons of whom they know nothing in the hope of thus securing some enormous gain. It may be laid down as an infallible rule that an invention that is really valuable can always be disposed of privately and readily for its full worth, and the owner of the right, fully appreciating this fact, is never beguiled by such dazzling

baits as are offered by these swindling agencies. We are perfectly well aware that it is about as hard to show an inventor that his device, when once patented, is of small utility and value, as to convince a mother that her baby is ugly, and both individuals usually resent the imputation in about the same manner. It is these very inventors, however, who, having exhausted every plan to dispose of their rights, snap at the allurements artfully held out to them, and of course are fleeced. The world gives little sympathy, for it laughs at their veridancy in being so readily deceived; but when the trials, the labor, and expense, which these men incur to carry out their cherished ideas, be reflected upon, the subject becomes more one for pity than for derision.

We would once more warn the people against not only the attempts to defraud, above exposed, but against every other they may receive that even appears of similar nature, particularly against specious parties who, for a certain sum, agree to sell a patent and advertise it in some patent journal or other obscure circular or sheet. It is very rarely that these men ever effect a sale; and if they be swindlers, they dare not announce the fact, if they have done so. Indeed, if any of our readers desire to prove for themselves the genuineness of the offers of their correspondents, they have only to write to the latter for the names of reputable persons whose patents have been sold through their agency; and if any be returned personal investigation will soon determine the question of authenticity.

FAILURE OF THE NEW TELEGRAPH LINE BETWEEN EUROPE AND AMERICA.

We are sorry to know that the new enterprise which was intended to secure the opening of telegraphic communication between the old and new worlds at reduced prices, has, according to the latest advices from London, become a failure. The money paid in has been returned to the stockholders. The title of the organization is the Light Cable Telegraph Company, and they have for some time been engaged in winding the wire preparatory to sinking an ocean cable from Great Britain to our coast of New Hampshire, via the Azores, Newfoundland, and Nova Scotia. The charge for messages was to have been 50 cents a word, the present rates being one dollar per word.

The capital of the company was \$2,000,000. The cable was to have been much lighter and cheaper than any ocean cable of equal length. The conducting wires were protected by a simple covering of tarred Manilla hemp, which has been found by experience to be almost indestructible in salt water. The weight of the new cable was only a little over 700 lbs. to the mile, or 150 lbs. per mile in water. Messrs. Mitchell & Co., Newcastle, Eng., have lately completed a new steamer of 5,000 tons burden, specially intended to receive and submerge the new cable, the laying of which was expected to commence about the middle of June next.

The engineer and electrician was Mr. Robert Sabine. Sir Samuel Canning was the consulting engineer. We still hope that a reorganization may be effected on a basis that will insure the laying of the cable.

RELATIVE RIGHTS OF EMPLOYERS AND WORKMEN IN RESPECT TO INVENTIONS.

If there were likely to be any permanency or reliability in the official decisions of the Patent Office, the case of interference which we publish herewith, on another page, would be of interest and value. It exhibits in a tolerably clear light the relative rights of employers and employees in respect to the ownership of inventions. The doctrine now held by the Patent Office is that the inventor has the right to avail himself of the mechanical skill of those whom he employs to put his invention into practical form. If the inventor gives general directions to his workman to produce a certain machine, the combination of parts or arrangement so produced belongs exclusively to the inventor, and the workman has no patentable right therein. This should be distinctly understood and remembered by workmen. But when a workman himself suggests and invents an improvement, without previous direction from his employer, the invention belongs to the workman, and the employer has no claim thereon, although the device may have been made in the shop of the employer, with his tools, and during time belonging to him. This should be distinctly understood and remembered by employers.

THE OIL DEPOSITS OF THE GREAT WEST.

About eight hundred miles west of Omaha the line of the Union Pacific Railroad crosses Green River, and the approach to the river is for a considerable distance through a cutting, of from 20 to 40 feet in depth, made in rock. During the construction of the road, some workmen piled together a few pieces of the excavated rock as a protection for a dinner fire, and soon observed that the stone itself ignited. The place thereafter became known as Burning Stone Cut.

The general superintendent of the road, Mr. T. E. Sickels, has caused analyses and experiments to be made with this substance, which proves to be a shale rock, rich in mineral oils, which may be produced by distillation in abundant quantities, say thirty-five gallons to the tun of rock, at the cost of a few cents only per gallon. The oil thus obtained is of excellent quality and comes over in two or more grades one suitable for burning and one for lubrication. Its abundance and cheapness of production is such as to render it certain that the markets of the Pacific coast, and all places west of the Mississippi, will ere long be wholly supplied from these deposits. The oil can be distilled, delivered, and sold at the points indicated, at cheaper rates than the Pennsylvania and West Virginia oils can be transported to the Mississippi.

The deposits in question are supposed to cover an area of territory one hundred and fifty miles long and fifty miles

broad. They overlie the immense coal beds found in that region, and consist of sandstone impregnated with oil. They are supposed to have originated by the absorption of oil by sand, the oil having been expelled from the ancient vegetable growths by heat and pressure, during the original process of coal formation.

These rich oil shales may be loaded directly into the cars from their native ledges on each side of the track of the existing railway, and their possession must ultimately yield an immense revenue to the company.

ENFORCEMENT OF UNAUTHORIZED CAVEAT RULES.

It has heretofore been the practice of the Patent Office to permit the widest liberty to inventors in the matter of their caveat papers. A photograph, a pen and ink sketch, a drawing of almost any kind, has sufficed, and this freedom has always been a matter of much satisfaction to persons engaged in studying and working out inventions.

In the other departments of the Patent Office, the inventor has been subjected to trouble and expense by the introduction of new rules, or the addition of new forms and ceremonies in the obtaining of patents. The one oasis in the Patent Office desert has been the caveat bureau. Here the inventor has always felt that restrictions were to a great extent removed. He was at liberty to block out his papers in the crudest style if he pleased, and, by payment of ten dollars, have them stuffed away into the official pigeon holes, taking an official receipt therefor. He has always known that his chances of receiving official notice of competing applications for patents were improved by having his caveat papers prepared in a clear and careful manner. Nevertheless, in very many cases, he prefers to describe his invention in his own style in the caveat, even if the officials make his lack of time an excuse for their neglect to send him the notice. Even without the notice, he has found the free caveat facilities, heretofore afforded by the Patent Office, to be a real convenience and comfort.

But the Commissioner of Patents has concluded to deprive the inventor of these satisfactions by requiring that, hereafter, all drawings for caveats shall be done according to the red tape rule. Photographs and ambrotypes (which, by the way, are the cheapest, most convenient and best modes of clearly reproducing a new thing) are now excluded from caveats; so are the ordinary pen and ink and pencil drawings, done on common foolscap paper, uniform with the specification. Inventors who wish to file caveats must now furnish drawings or tracings done on the official sizes and separate from the specifications. Few inventors can do this. They must in future employ agents to make special drawings for them, and pay special charges therefor, thus considerably increasing the expenses of the caveat.

We think this enforcement of rules is entirely unnecessary. It is doubtless a convenience to the clerk who files the caveats, and probably the papers look a little better to the official eye, when filed, if all are uniformly executed. But it is doubtful whether the rule will serve any other purpose. It will certainly subject the caveator to increased expense and inconvenience.

In respect to the filing of applications for patents, the law is very specific. It recites that the applicant shall file a full, clear and concise description of the invention, framed in such exact terms as to enable any person skilled in the art to make, construct and use the same. When the nature of the case admits, drawings must be furnished, and also a model.

In respect to caveats, the law contains no such requirements. It reads as follows:

"Any citizen of the United States, who shall have made any new invention or discovery, and shall desire further time to mature the same, may, on payment of the duty required by law, file in the Patent Office a caveat setting forth the design thereof, and of its distinguishing characteristics, and praying protection of his right until he shall have matured his invention; and such caveat shall be filed in the confidential archives of the Office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof; and if application shall be made within the year by any other person for a patent with which such caveat would in any manner interfere, the Commissioner shall deposit the description, specifications, drawings, and model of such application in like manner in the confidential archives of the Office, and give notice thereof, by mail, to the person filing the caveat, who, if he would avail himself of his caveat, shall file his description, specifications, drawings, and model within three months from the time of placing said notice in the post office in Washington, with the usual time required for transmitting it to the caveator added thereto, which time shall be indorsed on the notice. And an alien shall have the privilege herein granted, if he shall have resided in the United States one year next preceding the filing of his caveat, and made oath of his intention to become a citizen."

It will be noticed that the law does not prescribe the supply of drawings or models, but leaves the creator free to make up the contents of his caveat to suit himself. We believe that the Commissioner's stringent rule in regard to caveats is not warranted by law. Rule 97 reads as follows:

"When practicable, the caveat must be accompanied by full and accurate drawings, separate from the specifications, well executed on tracing muslin or paper that may be folded, and of the same size as demanded in drawings for patents."

Under the general powers of the Commissioner, he may doubtless give minor directions as to the size of sheets, etc.; but in ordering that the caveat must be accompanied by full and accurate drawings, separate from the specifications, he probably exceeds his authority. We hope the order will be modified so as to bring it within the terms of the law, while

granting the utmost possible latitude to the caveator in preparing his papers.

MOUNT SINAI.

The exact location of this memorable spot, sacred in the minds of all Christian people as the place where Jehovah appeared to man in fire; where the Ten Commandments were written by the finger of the Lord upon two tables of stone and delivered to Moses—has always been unsettled. But a Calle telegram announces that all doubt is now removed. Dr. Beke, the celebrated scholar and traveller, gives as the result of his recent expedition: the discovery of Sinai and the finding of verifying inscriptions, of which he has made copies. The cable despatch says that the expedition places the holy mountain at "a day's journey northeast of the village of Akaba, Arabia, at an altitude of five thousand feet above the level of the sea."

Dr. Beke has long maintained that Sinai was an extinct volcano, and the correctness of that opinion is now said to be fully confirmed by his personal explorations. Indeed, the Biblical account of the manifestations, which took place at Sinai in the presence of the tribes of Israel, corresponds in several respects to the descriptions given in these modern times of the volcanic eruptions of Vesuvius. In the nineteenth chapter of Exodus the following graphic narrative is presented:

"And it came to pass on the third day in the morning that there were thunders and lightnings, and a thick cloud upon the mount, and the voice of the trumpet exceeding loud; so that all the people that was in the camp trembled.

And Moses brought forth the people out of the camp to meet with God; and they stood on the nether part of the mount.

And Mount Sinai was altogether on a smoke, because the Lord descended upon it in fire; and the smoke thereof ascended as the smoke of a furnace, and the whole mount quaked greatly."

Moses then went up the mount, and the Ten Commandments were proclaimed; the inspired narrator adds:

"And all the people saw the thunderings, and the noise of the trumpet, and the mountain smoking; and when the people saw it, they removed and stood afar off."

Subsequently, it will be remembered, the Israelites forgot their vows and went back to heathenish practices of idol making, and set up a metallic calf. Moses, on coming down from the mount, had the tables of stone in his two hands; and when he saw the molten calf, he threw down the tables and broke them in pieces. Then he broke up the idol, pounded it into fine dust, which he scattered in a brook that came down from the mount. The inspired narrative then tells us how, by prayer, the Lord was appeased, and He commanded Moses to hew out another pair of tables, and take them up the mount, which he did. Whereupon the Lord again wrote out the same ten commandments as at first, and gave the two new tables to Moses, who brought them down from Sinai and put them in an ark which he had made of shittim wood, "and there they be." Deut. X, 5.

It would be interesting to know what kind of stones are conveniently found at Sinai, out of which Moses might have hewn the tables. From their light weight, indicated by his carrying one in each hand, going up and down the mountain, it would seem as though they might have been composed of slate or other laminated formation. We presume that Dr. Beke's report will give full particulars of the geology of the neighborhood, and perhaps tell us something new about the Mosaic stones.

PLEASANT WORDS.

We are receiving so many kind letters of encouragement and approval of our efforts that, while we should delight in returning our sincere thanks individually to each writer for his good wishes, we would but trespass on the good nature of our readers in monopolizing too large a space in columns which might be filled with more generally interesting matter. We trust, however, that we may not lay ourselves open to the imputation of undue egotism by quoting a few of the pleasant words we receive, since we do so more to mark our appreciation of the spirit which prompts them than for the benefit they may secure to us in the commendation which they express:

"I have completed my quarter of a century as a reader of your paper, and a good portion of that time have been a direct subscriber. I thought to do without the SCIENTIFIC AMERICAN this coming year, but it won't work, so I try it another year. I have been trying to find fault with it all my life, and for all I know will continue trying, and so far unsuccessfully," says one correspondent, and a score or so more writers echo about the same opinion. The *Science Record* for 1874 is also coming in for its share of approval. A letter before us says: "It is a perfect storehouse of valuable and instructive information," and another reader tells us that the lady members of his family join with him in thinking it "one of the most useful and interesting books in the library." For all of which very flattering comments we metaphorically disapparel our heads, make our very best bow, and, with conscious unworthiness, return acknowledgments as grateful as they are sincere.

SCIENTIFIC AND PRACTICAL INFORMATION.

TRIAL OF THE WATER WORKS AT ROCHESTER, N. Y.

The water works of the city of Rochester, N. Y., constructed on the Holly system, have recently been completed, and on the occasion of a public test developed a power and capability which may be fairly considered as unprecedented. The machinery consists in two sets of pumping engines, each of four double acting cylinders 9×24 , each set being arranged to take suction and discharge at eight suc-

cessive and equal points during the revolution, to give a uniform and steady flow. These supply the mains and pipes for ordinary use and are run by two turbine wheels driven under a 90 foot head. There are also two pairs of double cylinder steam engines, actuating four double acting pumping engines $10\frac{1}{2} \times 27$, a 150 horse rotary Holly engine, and two rotary Holly pumps. The capacity of all is not less than 4,000,000 gallons per hour in the street mains per 24 hours, and 3,000,000 gallons in the same time can be delivered extra, by the steam machinery. The water is taken to the city by an aqueduct from Hemlock Lake. On the occasion of the trial, says the *Rochester Union*, the works succeeded in throwing thirty large streams at one time, to a sufficient height to be efficacious in cases of fire, reaching an average altitude of 135 feet; one two inch stream was thrown up 220 feet; one four inch horizontal stream was thrown 465 feet; one three inch stream reached an altitude of 285 feet; a four inch vertical stream was thrown 287 $\frac{1}{2}$ feet; and a vertical stream five inches in diameter was thrown 250 $\frac{1}{2}$ feet! These are, indeed, astounding facts. It was, however, in the thirty stream test that the practical usefulness of the system was most clearly demonstrated. The four and five inch streams could rarely if ever be rendered useful for fire purposes, and it is doubtful whether under any circumstances it would be safe to have recourse to them. So great is the force of the torrent thrown from the standing pipes that few buildings in any city would be able to stand up long under it.

A NEEDED IMPROVEMENT IN SUGAR MAKING.

Mr. José Guardiola, of Hacienda, Chocó, Guatemala, the inventor of several improved machines for sugar making, coffee drying, etc., descriptions of which were some time since published in these columns, forwards us a letter inquiring whether there is any means by which sugar drained in centrifugal machines can, after the operation, be compressed into loaves or square cakes, so as to remain as hard and compact as ordinary sugar loaves drained in the mold. To drain sugar in a centrifugal machine is an operation which takes but a few minutes, and has the advantage of economy of time and cleanliness; while on the other hand purging sugar in molds requires from six to ten days, increased expenses, more buildings, and greater waste. Our correspondent thinks that pressure will not effect the desired result, but we hardly agree in this view. As long ago as thirty years, sugar was pressed in copper molds. In regard to his inquiry above, however, we learn upon investigation that, if the crystals are compressed when damp and the sugar put into a drying room heated to a temperature of 130°, adhesion will be likely to take place.

THE CHILI EXPOSITION.

In relation to the projected international exposition, to be held in the fall of 1875, in Santiago, Chili, our manufacturers would do well to bear in mind that at the present time fully ninety-five per cent of the trade with Chili is monopolized by England, as against five per cent with the United States. The South American Republics undoubtedly offer a great market for our productions, and it would seem, from our geographical position, that the advantages of the same should be to us instead of to Great Britain. The reason is, however, the lack of an extended means of communication between the United States and Chili as exist between Chili and England; but it would appear that, were the limits of trade between the two first mentioned countries enlarged, the facilities for its greater pursuit would necessarily follow. We have received a prospectus of the enterprise, which gives full particulars. Information may be obtained from Mr. Stephen Rogers, Consul for Chili, 249 West 42d street, New York city.

STEAM ON THE CANALS.

The commissioners appointed to examine the inventions submitted as appliances for steam navigation of the canals, and in competition for the reward of \$100,000 offered by the State of New York, have made their final report to the Legislature. The committee were not unanimous, owing, as they state, to the ambiguity and extreme stringency of the law creating the commission, and were unable to make the award under the circumstances, and they leave to the Legislature the question of compensation. Mr. Baxter's boat, they admit, distanced all competitors, but it is believed that Mr. Dobbin's device also possesses great merits, so the matter is compromised by suggesting that \$35,000 be paid to the first named inventor on his placing upon the canals seven vessels, built and equipped in like manner as the boat tested, and \$15,000 to Mr. Dobbin on his supplying three, constructed according to his plan. It seems to be the general opinion that the act providing for the above mentioned sums will be passed and the matter thus ended.

THE RAPID PROPULSION OF FLOATING BODIES.

It has been remarked in England that, on the canals, the boats, when drawn by horses at a considerable degree of speed, float higher in consequence of the oblique action exercised by the water. Impelled at an enormous velocity, floating bodies would merely scrape along the water, like a *ricochet* bullet.

The English Admiralty recently charged Mr. Froude to examine into the phenomenon; and he finds that the laws of the resistance of a plane surface, A , placed in the water under an angle, θ , are the following: $P = 3.43 A v^2 \sin \theta$ for a plane deeply immersed, and $P' = 2.14 A v^2 \sin \theta$ for a plane placed at the surface. The vertical component is $P \cos \theta$.

An example will render this clearer: A floating body displacing 2,500 tons, of which the bottom has an inclination of 4 inches to a foot, is given a velocity of 16 knots, that is 26.4 feet per second, and thus causes an emersion of 171 tons. Substituting the latter number in the formula, the velocity gained will be 7.6 feet per second.