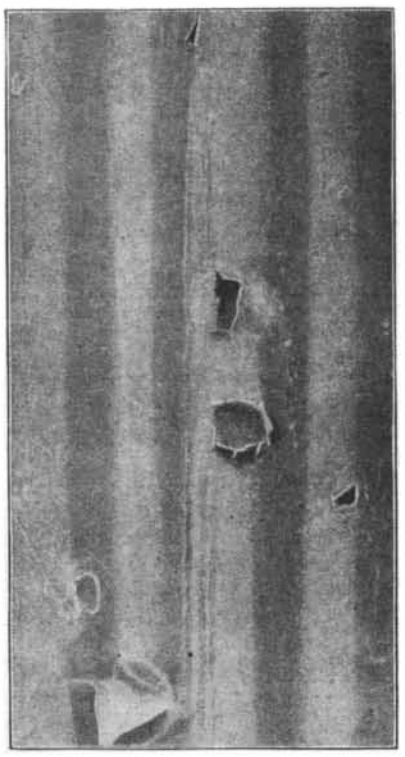
IRON PIERCED BY HAILSTONES.

One is justified in many cases in giving only a tentative belief to many of the big hailstone tales over which some travelers delight to spread themselves, says the St. James's Budget. A correspondent in Dholi, Behar, however, sends the indubitable proof of photographs to quite convince us and our readers of the terrible nature of the hailstorm which occurred in his district recently. The storm passed over the greater part of the districts of Mozufferpore and Durbungah, but it appears to have concentrated itself with special fury over the indigo factory called Dholi. Here the storm was terrific, even for tropical regions, the hailstones weighing as much as five ounces. On an average they were as large, if not larger than cricket balls. It can be easily understood that the damage done was great. Not a whole tile was to be found in the roofs, trees were uprooted, birds were killed, and general destruction wrought all round. What is more astounding, the corrugated iron roofing over many of the factory buildings was riddled as if it had been shelled by a battery. We can quite imagine, as our correspondent informs us, that no storm like it has ever occurred in the district. Hailstones have, however, had the same terrific force in Africa, a sample of corrugated iron pierced in a like manner having been recently shown in London.



CORRUGATED IRON PIERCED BY HAILSTONES.

THE PROPULSION OF BARGES.

The propulsion of barges, especially upon canals, is not as yet effected in a really satisfactory manner. This is because multiple and special difficulties are met with. In the first place, it is necessary that the boats shall be able to run isolatedly, since the formation of trains is almost impracticable, generally speaking, by reason of the loss of time that it involves. Recourse to complicated methods of propulsion cannot be thought of, since the bargeman, who has no special education, must perform the necessary maneuvers without any trouble. It is indispensable, too, that the mechanical means adopted shall not introduce any modifications into the hull of the barge. Moreover, the propeller, if it be adapted to the hull, must not interfere with passages into locks or under bridges, and its weight or its installation must not cause any loss of the space reserved for the cargo. Finally, account must be taken of the fact that aquatic plants, so abundant in many canals, may interfere with the play of the propeller, and that the latter is capable of forming waves that are prejudicial to the proper preservation of the banks of the waterway.

For these various reasons and for several others, different methods of propulsion have been tried, such as the Levy or Oriolle cable system, the Galliot system of electric towing, etc. Mr. H. Barcroft, an English engineer, has just devised a method of propulsion by screws, but under very peculiar and very original conditions. While some have endeavored to place the screw upon the rudder, in elongating the latter, Mr. Barcroft arranges his propeller on each side of the rudder at the stern of the boat. In its installation, he has taken as a basis the principle enunciated by Rankine, viz., that the most efficacious propeller is the one that forces back the greatest volume of water at the feeblest velocity. On another hand, he has endeavored to make a removable apparatus that can be easily put on shore or be embarked and put in place without any change in the arrangement of the boat.

What adds to the interest of the invention is that it has withstood the test of practice. It is now more than a year ago that a boat provided with the arrangement in question was put in service upon the canals of the north of Ireland. This boat, which is called the Ulster, is now running upon the canal of the same name between Lough Erne, Lough Neagh, and the sea. This navigation is so much the more difficult in that the section of the waterway is often only double the transverse section of the boat, that there are many aquatic plants, and that billows are often encountered upon the lakes that must be traversed.

We present engravings representing the arrangement of the boat. Let us examine the barge Newry, which is 62 feet in length and 11½ in breadth and draws 5½ feet of water. With the motor installed it has an effective load of 65 tons. The motor weighs 6,600 pounds. It comprises a locomotive boiler with a heating surface of 87 square feet, and a horizontal engine with two cylinders 46 inches in diameter and having a stroke of 80 inches, the whole placed upon the deck without causing any real encumberment. As the axes of the cylinders are lengthwise, the shaft is breadthwise.

At each of its extremities it carries a helicoidal toothed wheel that gears with another wheel of the same form placed upon a vertical shaft and carried by a frame fixed to the posterior part of the hull. The two frames are shown in Fig. 2. It will be remarked that they are provided with a supplementary frame, P', designed to protect the blades of the screw against the shocks to which its situation might expose it. At the base of these frames the vertical shafts actuate the screws through bevel wheels. These screws have three blades, this number giving the best rendering with a suppression of vibration. The diameter of each screw is 4¾ feet, with a total surface of 24 square feet. The blades are of steel and their pitch is a little over 5 feet. At a normal speed the screws make 100 revolutions a minute. The hub of the screw, which is cast in a piece with the bevel wheel, revolves around a horizontal axle that carries the step bearing in which rests the lower end of the vertical axle. It presents an enlargement forming a collar that receives the thrust of the screw upon a surface of 8 square feet. The internal arrangement of the hub of the screw upon this axle and this collar is entirely analogous to that adopted for what is called the "patent" carriage axle. A constant bath of oil diminishes the friction to a considerable degree.

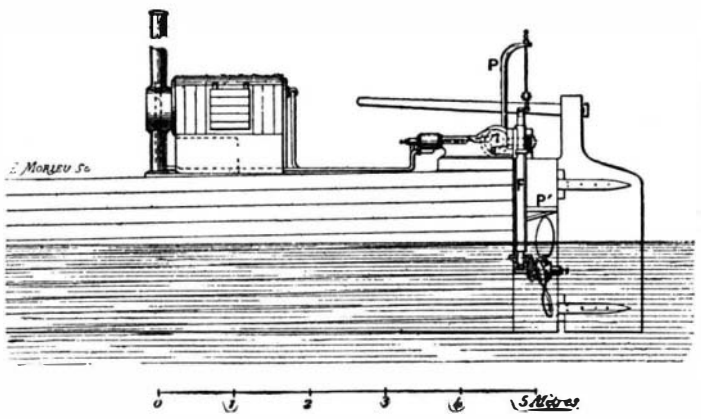


Fig. 2.—DIAGRAM EXPLANATORY OF THE BARCROFT PROPELLER.

As has certainly been remarked upon the first glance at the figures, the screws are far from being entirely submerged. This arrangement has been much criticised, since, in matters of maritime navigation, it is considered necessary that the propeller shall be constantly submerged, as otherwise it would, in its revolution, carry along a certain quantity of air that would by so much diminish the density of the liquid in which it revolves. But here it is a question of navigation upon canals, where there is practically no carrying along of the air, since the velocity of revolution is feeble, and where it is necessary to prevent the blades of the screw from becoming entangled with aquatic plants. Let us note, moreover, that the submersion of the screw is variable according to the pleasure of the bargeman. To this effect the vertical shaft is capable of rising or descending along the frame, F, in carrying along the propeller according to an arrangement frequent in many machine tools. This movement is obtained very simply by means of a standard, P, and a screw that is revolved by hand. Bargemen very quickly recognize the submersion that produces the best results for a given boat and maneuver correspondingly. For a draught of five feet, the lower part of the blades should be about forty inches beneath the float water line.

Upon a boat provided with this arrangement one man and a boy suffice as a crew. The steam engine may doubtless be easily replaced by a gasoline motor. In the trips made by the Ulster with a boat in tow and a total load of 107 tons, the usual speed reached is three miles an hour with a recoil of 11 per cent solely and a consumption of 275 pounds of coal for 13 miles. —La Nature.

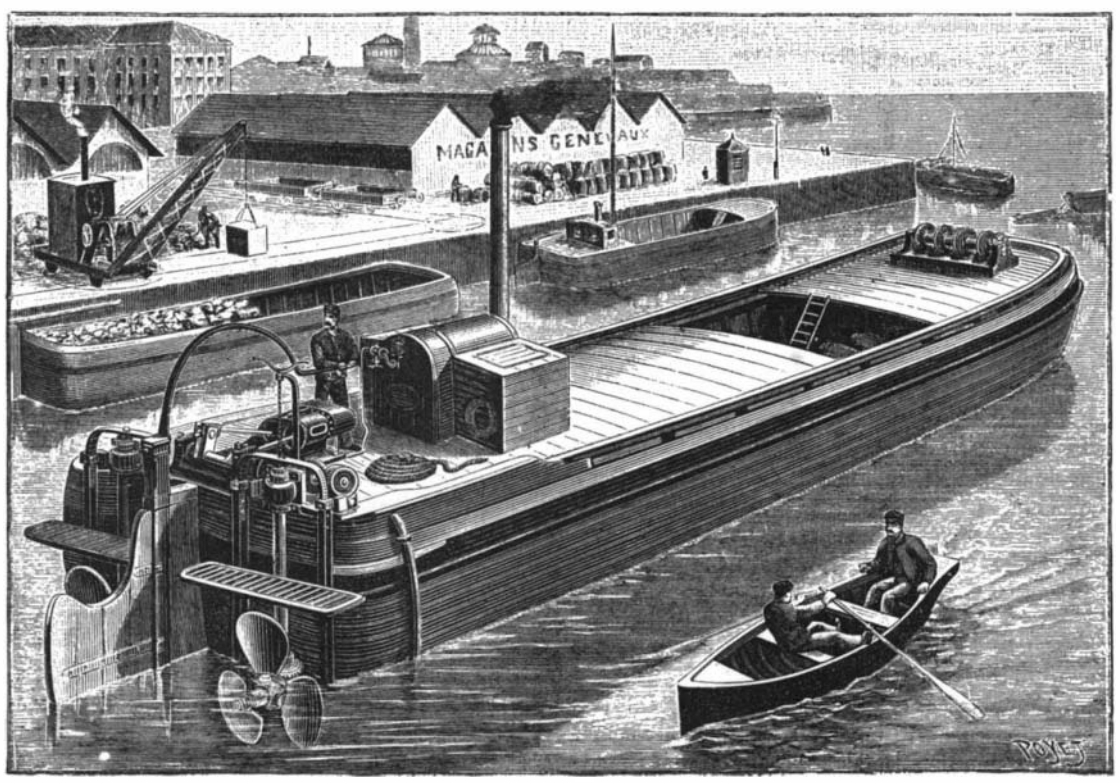


Fig. 1.—GENERAL VIEW OF A BARGE PROVIDED WITH THE BARCROFT PROPELLING APPARATUS.

Proposed Polar Exploration.

The expedition to Jones Sound, planned for 1897, is intended to initiate a system of continuous Arctic exploration. Its object is to be the scientific research above indicated, and to this all else will be subordinated. Special attention will be paid to geology. Disasters having been plainly due to lack of a secure and always accessible base, the first object will be the establishment of a base at the mouth of Jones Sound, which Julius von Payer calls "the one spot most suitable for such a base." Being in assured annual communication through the Scotch and Newfoundland whalers, a well housed and well provisioned party, with some Eskimo families, will be as safe there as anywhere on earth, and will have before it a field unequaled in richness and extent. To the north, the west coasts of Ellesmere Land and Grinnell Land are to be explored; to the northwest, the triangle between those coasts and the Parry Islands is to be rescued from the unknown; to the west, the interior of North Devon is an interesting problem; to the southwest, Prince Regent Inlet may present an avenue to the magnetic pole; to the south, Baffin Land—with its Eskimo settlements, its herds of reindeer, its wealth in fishes and birds, its fossils and minerals—offers a tempting field, larger than the British Isles. Even Greenland may not be beyond the sphere of that strategic point.

Such a system, once initiated, will cost very little. Lecturing tours and the sale of collections will defray a large part of the cost. Considering the enormous sums spent on Arctic exploration in the past by governments and by individuals, it seems probable that when the system is once in running order it will not lack patrons. The cost of the initial expedition is estimated at five thousand dollars. Much smaller sums will probably suffice in subsequent years.—Robert Stein, in Appletons' Popular Science Monthly.

A LABORATORY for the examination of patients by the Roentgen rays has been established in Berlin under Prof. Buka, of the Polytechnicum.

Bequeathing Brains to Science.

A SOCIETY AT CORNELL TO ENCOURAGE THE PRACTICE—RESULTS TO BE GAINED.

The following form of bequest can be obtained by applying to Prof. Burt G. Wilder, Cornell University, Ithaca, N. Y.:

I, ———, now of ———, student of Cornell University from ——— to ———, and graduate in ———, recognizing the need of studying the brains of educated persons, rather than those of the ignorant, criminal and insane, in order to determine their weight, form and fissural pattern, the correlations with bodily and mental powers of various kinds and degrees, and the influences of sex, age and inheritance, hereby declare my wish that at my death my brain shall be intrusted to the Cornell Brain Association (when that is organized) or (pending its organization) to the curator of the collection of human brains in the museum of Cornell University, for scientific uses, and for preservation, as a whole or in part, as may be thought best. It is my hope that my family and friends may not oppose this my earnest wish.

Signature ———

Date———

Witness ———

In 1890, following the example of the French Société Mutuelle d'Autopsie, the American Anthropometric Society was formed in Philadelphia, says the New York Tribune, and Prof. Wilder was a member of the Publication Committee. The articles of incorporation of this Philadelphia society required that all brains should be disposed of at the headquarters of the society. From the first Prof. Wilder was not in accord with this restriction, and in December of 1891 he resigned, giving among others as a reason for his resignation: "My own circumstances and plans for investigation would preclude any such active co-operation as might naturally be expected. With hearty good wishes for the success of the society as a local or university organization for the increase and dissemination of important and accurate knowledge respecting the brain, I remain, etc."

On account of that love that still clings to the ashes in fond yearning, and in other cases a religious sentiment against mutilating that which was once the temple of the Holy Ghost, science has been restricted in its examinations of the brain almost entirely to criminals and insane people, of whom in life the world knew nothing. The Cornell Brain Association wishes to widen out the minds of people, and convince them that to have their brains preserved and studied is an honor to be coveted.

It pointedly asks: "Who can set a limit to the results that might have been attained from the examinations of the brains of soldiers like Grant, Sherman and Sheridan, of preachers like Beecher, Brooks and Howard Crosby, and naturalists like Agassiz, Gray and Jefferies Wyman; of lawyers like Tilden, Conkling and Benjamin Butler? How long must science wait for a general sentiment such as is embodied in the declaration of an eminent historian that science is as welcome to his brain as to his old hat, and that he wishes he had ten of them?"

The American Anthropometric Society at Philadelphia has the brain of Joseph Leidy, its first president; and the brain of George Grote, the historian of Greece, has been described by John Marshall.

The great need of average brains has been firmly impressed upon Prof. Wilder. Of this matter he says: "Another matter has impressed me more and more during the last year, namely, the need of a fissural standard based upon the careful comparison of large numbers of average, intelligent, educated and moral individuals, excluding the eminent as well as the immoral, the ignorant and the insane."

It is understood that in all cases, even where it has been the manifest desire of the defunct that his brain should be given to the Cornell Brain Association, should the near relatives object to the fulfillment of the bequest, such desires of the living shall be respected. At the present time most of those who are willing to devote their thinking organs to the services of their successors have been recruited from the ranks of the Cornell University in some way; they, the testators of brains for study and preservation, were graduates, members of the present teaching body or former professors. There are some others; among these are a brother and sister, orphans, who have no near relatives who might object.

Size of the brain, to be an indication of power, must be aided by other attributes. In substantiation of this, Prof. Wilder calls attention to two brains obtained by him in 1891, one from a lawyer and writer, the other from an ignorant black janitor. There was but little difference in the amount of fissuration. When fresh, the lawyer's brain weighed 1,225 grammes (43·20 ounces), the janitor's 1,250 grammes (44·09 ounces). The janitor was heavy and strong, the lawyer spare, though active. The lawyer was under thirty years of age, the janitor was in his ninetieth year.

Even the brain of the baboon that died in the Central Park managerie has contributed its not-to-be-despised quota to science, since its examination has to an extent caused science to qualify the statement that "the human brain is relatively heavier than that of any animal larger than a cat in which the cerebrum is fissured." This baboon died of tuberculosis, and his age was unknown. The keepers thought him to be about seven years old. But his post-morten examiners stated that "incomplete dentition indicated about two years." The body of the baboon weighed 5,738 grammes (12·6 pounds) and its brain 171 grammes. The body of the baboon is thus only 35·5 times as heavy as the brain. In healthy human beings the ratio is about 1 to 45.

Trolley from New York to Philadelphia.

Mr. Frank A. Magowan and J. Henry Darrah, of Trenton, N. J., after nearly a year's hard work, have formed a syndicate of New York and Philadelphia capitalists to construct an electric railway between New York and Philadelphia, the distance being nearly 100 miles as the road runs. The New York and Philadelphia Traction Company has been formed, and associated with it is the Central Jersey Traction Company.

At the head of the enterprise is Mr. J. Canby, of Philadelphia, who has had much experience in traction railways. The syndicate for the traction road through New Jersey is not only formed, but stock has been transferred and a partial payment made to the promoters, Messrs. Magowan and Darrah, and John Blair McAfee, of Philadelphia.

Work upon the new road is to be commenced in a few days. A contract has just been given out for operations between New Brunswick and Bound Brook and Raritan and Dunellen which will amount to $475,000. A power house to cost $100,000 is to be erected near Bound Brook.

The New York and Philadelphia Traction Company was incorporated on July 13, 1894, with a capital stock of $10,000,000, by Frank A. Magowan, who took in the Central New Jersey Traction Company. There will be 1,000 miles of road, connecting nearly all the large towns of New Jersey.

The direct line of the main stem will begin at Paterson, where connection will be made with the present system. Then the road will pass through Upper Montclair, Montclair, Bloomfield, Orange, East, West, and South Orange, Maplewood, Wyoming, Springfield, Westfield, Fanwood, and Northwood, to a connection with the present system in Plainfield, and thence through Plainfield to Bound Brook.

Crossing the New Jersey Central Railway at Finderne, the road will continue through Hillsboro and Weston, and thence to Millston, Rocky Hill, Princeton, Lawrenceville, and Trenton.

Branches will run from Bound Brook to New Brunswick, Somerville, and Raritan; from Bloomfield to Irvington, and to Morristown, via Chatham and Madison. At Irvington connections will be made with the existing lines, making a direct route to Newark and Jersey City.

From Westfield the road will run to Rahway, connecting there with the line to Lebanon and Boynton, South Beach, Woodbridge, and Perth Amboy. From Rahway the line will go to Elizabeth, and a branch will connect Bound Brook with New Brunswick.

From Trenton, the road will pass through Morrisville, Bristol, Cornwells, Terresdale, Tacony, Holmesburg, and Frankfort, and thence into Philadelphia.—The Electrical Engineer.

How do Rains and Winds Spread Epidemics?*

Prof. Charles Mayer, as quoted from the Tennessee Journal of Meteorology, says:

"Occasionally epidemic diseases seem to have been spread by clouds and the rain from them. The best authenticated case is that of a plague epidemic in the fifteenth century, which broke out most violently in a Swiss town immediately after a cloud, coming from an infected but distant region, discharged its rain upon that town."

The relations of the weather to the spread of epidemics are still involved in great obscurity. Without going back to the fifteenth century, there was an excellent opportunity to investigate the subject in 1889–90, when the grip spread over the whole civilized world. Its progress was so regular that for a long time there was a general belief that the active germs of influenza were carried as dust in the air by the winds, or perhaps by the upper currents. This idea was dissipated by several memoirs that established the fact that the wind and weather were entirely subordinate factors and that the spread of the disease followed the lines of travel, especially the principal steamboat and railroad routes, and that, therefore, the germs were carried by diseased individuals or by articles that had been used by or had come in contact with them, and not by the winds. Of course the wind, in the narrow sense, may have carried the germs a few feet or rods from one individual to another, but not for distances of many miles. Several epidemics, such as the yellow fever, smallpox, and cholera, have been traced back to the direct importation of their contagia (whether animate or inanimate) by human agencies. Furthermore, it appears probable, from experimental data, that few disease germs can maintain their vitality more than a few hours when freely exposed to the air and sunshine, as would probably be the case if they were carried in the atmosphere as minute particles of dust. Therefore we think it probable that the winds and the rain must not be considered as the means by which diseases are spread between places that are any considerable distance apart. The limit to which living germs can be carried in the free air is not yet accurately known, but is believed to be quite small. The upper currents of air carried the vapor dust from Krakatoa, in 1883–84, over the whole Northern Hemisphere, but many months were required to do this, and what little we know of the life history of disease germs teaches that they could not survive the sunshine, the dryness, and, perhaps, the cold of the upper currents. This is not to deny that the winds and the ocean currents can carry the coarser seeds of plants and fungi for many miles without injury; but the bacterial disease germs have a far more delicate organism than those seeds, and what would seem to be an allowable analogy between the transportation of seeds and germs fails when applied on a large scale. The wind may carry the germs to a great distance in the free air, but probably will kill them in so doing; local breezes may carry living germs a few hundred feet, but the diseased man or the convalescent, or the clothing and articles used by these, or the water we drink, or the food we eat, may carry them hundreds and thousands of miles. In the particular case of the spread of the epizootic and influenza epidemics of 1872–73 among horses and cattle it was shown that they spread against the wind, or when there was a calm, quite as often as they spread with the wind.

The following extract shows the result of an extensive investigation by the medical department of the Prussian army into the spread of the grip epidemic of 1889–90. It illustrates what we have above said and shows that we must not exaggerate the influence of the lower winds or the upper currents:

"If we now collect together the results of experience as to the spread of the grip in the German army, we find that the view still holds good which prevailed at the beginning of the epidemic to the effect that the influenza is a disease that owes its origin to certain miasmatic external causes. On the other hand, there does not appear to be any sure evidence of the influence of weather, climate, wind, or soil, or the season of the year. To the contrary, the number of those cases in which the spread and the mode of spreading of the grip is to be attributed to human intercourse is considerably increased by the experience of the last epidemic. It is not yet clear whether in this intercourse there is a direct carriage of the infectious material from person to person or whether the infection is carried by the intervention of inanimate objects through the air. We are still ignorant of the real germ that causes the disease. A correspondent from Bavaria gives the following example, which leads him to believe that inanimate substances may house the real germs of the disease and carry them far away. The medical officer of the garrison at Germersheim, at a time when as yet not a single case of grip had occurred at that place, received a package from a place in Russia at which the disease prevailed severely. A short time after opening this package he fell sick of the grip, and soon after also his whole family. If it should be further demonstrated that dead substances can thus contribute to the spread of the disease germs, then perhaps in this way we shall explain the appearance of the disease upon ships on the high seas. The germs attached to the cargo carried by a ship can, by spreading among the seamen, give rise to a violent, sudden outbreak of the grip."

* Prof. Cleveland Abbe, in Monthly Weather Review, August, 1895.

Gen. Casey's Skill in Estimates on Engineering Work.

The skill shown by the late Gen. Casey, chief of army engineers, in estimating in advance the cost of engineering will be better appreciated when we recall the errors made by others in similar calculations. The estimated cost of the Manchester ship canal was $28,750,000. Nearly $80,000,000 was spent before the canal was ready for business. The international commission reported in 1856 that the cost of digging the Suez canal would certainly not exceed $40,000,000. It had cost $94,500,000, to say nothing of Egypt's gratuitous building of lighthouses, dredging of the harbors, advance of money without interest, and gift of forced labor, the whole amounting to $20,000,000 more. Engineers spent a year collecting data for their report on the Congo railroad, which, they asserted, could be built for $5,000,000. They now say that the total cost will be from $12,000,000 to $13,000,000. The egregious underestimate of the cost of the Panama canal nearly swamped that enterprise before wholesale stealing completed the ruin. The forts on the Meuse River, estimated at $4,500,000, cost $16,000,000; the Corinth canal cost $12,000,000, instead of the estimated $6,000,000; a harbor and a railroad on the island of Reunion cost $13,500,000, instead of $6,800,000; the Senegal railroad, which was to be completed for $2,600,000, absorbed $9,000,000; and the Langson railroad in Tonkin, which was to open a conquered province for an expenditure of $500,000, bled the French treasury to the tune of $4,367,790.—Army and Navy Journal.