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NEW GRANARY AT BRISTOL, ENGLAND.

We present herewith an engraving of a building (lately erected at Bristol, England), which is a favorable specimen of highly ornate architecture applied to commercial purposes. The ground being defective for so heavy a structure, a layer, 6 feet thick, of ground brown lime concrete was spread over the whole site, and upon this platform the external walls were erected, to the great hight of 100 feet. The building is 95 feet long, 45 feet wide, and contains ten stories. The lowest story is used as one large bonded cellar, a portion of the top story for an engine room, and all the rest of the building for storing grain, and it will contain 96,000 bushels.

There are only nine internal supports for the granary floors, and this leaves the large floor space unusually free of pillars. The external walls are faced with the hard Cattybrook bricks, and advantage has been taken, of the necessity of obtaining a large surface for the introduction of air into the granary, for ornamenting the lower portion of the window openings with open patterns in brickwork. The great difficulty experienced in designing the usual external lifts and external doors on each floor, for the introduction and delivery of grain, has been avoided by arranging the lifts in niches at the angles of the building, and by delivering the sacks of grain into carts upon movable skids, sliding out of the round holes under the first floor string course. The cost of the building was $30,000.

Facts about Storms.

From the United States weather maps for 1872-3, Professor E. Loomis has made an extensive series of deductions, deriving many interesting facts, from which we take the following:

The average direction of the storm paths for two years was N. 82° east, or 8° to the north of east, and the average velocity was 25.6 miles per hour: but there is a noticeable variation, both in the direction and velocity, depending upon the season of the year. The course of storms is most southerly in summer, and it is a little less northerly in winter than it is in spring or autumn. July is the month in which the course is most southerly, and October is the month in which it is most northerly, the mean difference between these two months amounting to 33°. The velocity of progress is greatest in winter and least in summer

The diversity in respect to the velocity of progress of particular storms is still greater. In some cases a storm center has remained sensibly stationary for 24 hours, and occasionally still longer, while in four cases a storm center has advanced over 1,200 miles in 24 hours, and in one case, May 15, 1872, the average velocity for 24 hours amounted to 57·5 miles per hour. Thus the velocity of progress ranges from zero to 57·5 miles per hour.

The storm path may have every possible direction, and the velocity of progress may vary from 15 miles per hour toward the west to 60 miles per hour toward the east.

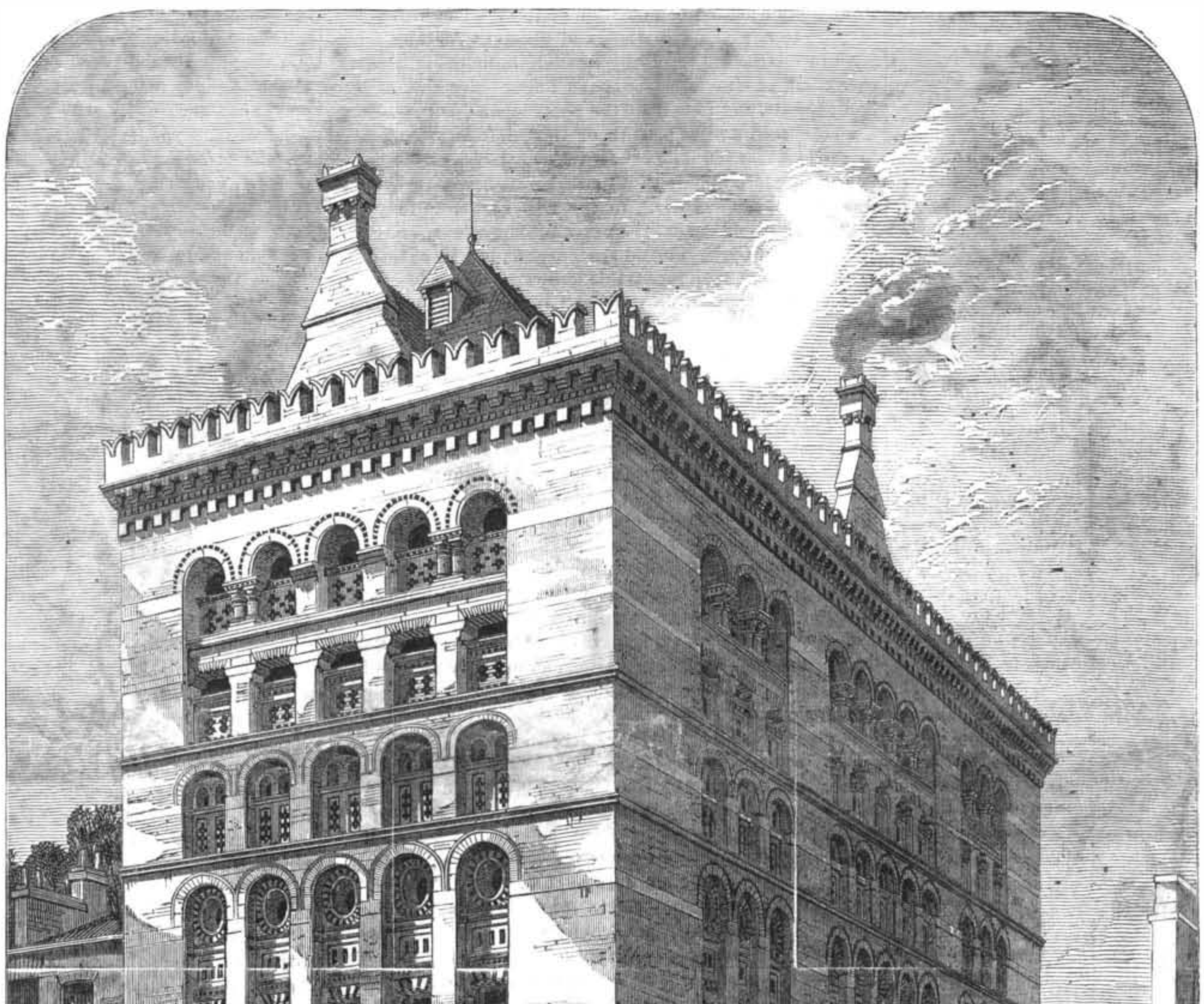
The fall of rain appears to have a decided influence in modifying the course of a storm path.

Every considerable depression of the barometer is accompanied by a fall of rain, and the area of rain fall usually extends further on the eastern side of a storm center than it does on the western side. The average extent of the rain area on the east side of the storm's center is 500 miles.

The fall of rain, that is, the precipitation of the vapor of the atmosphere, is generally accompanied by a fall of the barometer. According to the theory advocated by the late Mr. Espy, when the vapor of the atmosphere is condensed, its latent heat is liberated, which raises the temperature of the surrounding air, causing it to expand and flow off laterally in all directions in the upper regions of the atmosphere, thus causing a diminished pressure over the region of precipitation, and an increased pressure on all sides beyond the area of the rain.

The progress of the storm eastward is not due wholly to a drifting, resulting from the influence of an upper current of the atmosphere from the west, but the storm works its own way eastward in consequence of the greater precipitation on the eastern side of the storm. Thus the barometer is continually falling on the east side of the storm and rising on the west side, in consequence of the flowing in of colder air upon that side. The stronger the wind on the west side of the storm, the less is the velocity of the storm's progress.

Some persons might have anticipated that an increase in the velocity of the wind in the western quadrant of a storm would have the effect of driving the storm eastwardly more rapidly: that is, of increasing its velocity. But upon each side of a storm's center the wind blows obliquely inward, and hence we must infer that in the central region of the storm there is an upward motion of the air; and this is the cause of the precipitation of vapor, that is, the cause of the rain fall. An increase in the velocity of the wind in the western quadrant is accompanied by an increase in the velocity of the upward motion in this quadrant, that is, an increase of precipitation. This increased precipitation of vapor tends to depress the barometer on the western side of the storm, that is, tends to retard the eastward motion of the



NEW GRANARY AT BRISTOL ENGLAND.

storm's center; and this cause may operate with sufficient force to carry the storm's center westward, as actually happened in several instances in the years 1872 and 1873. On the other hand, an increase in the velocity of the wind in the eastern quadrant tends to produce a greater precipitation on the eastern side of the storm's center: that is, tends to push the storm's center eastward, or increase the velocity of its progress.

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Contents:

(Illustrated articles are marked with an asterisk.)

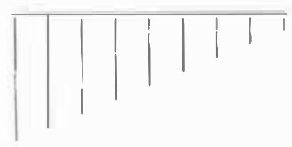
THE SIMULTANEOUS PERCEPTION OF SOUNDS.

The celebrated German physicist Helmholtz has, in his *Physiological Theory of Music*, made some modifications in various points of the hypothesis by which he accounts for the functions of our organs of hearing.

It will be remembered that, in the process of hearing, the sound waves of the air are collected by the outer ear which is peculiarly adapted by its form to concentrate them. The waves then pass along a canal to the tympanum or drum, which they vibrate. This vibration is communicated by a chain of bones to the membrane covering the *foramen ovale*, by which it is passed to the fluid contents of the inner ear and thus reaches the nervous surface which transmits to the brain the sensation of sound. It is not difficult to understand how the liquid in the inner cavities may be thrown into vibrations of which the durations are the same as those in the outer air, while the amplitudes are proportional, if acted upon by sound waves coming from a single source. But when we consider that the vibrations of so small a quantity of air as that contained in the auditory canal, transmitted to the still smaller surface of the inner ear, suffice to convey a perfect perception of the most complicated exterior phenomena, then the mystery begins. During the passing by of a military band, for example, we hear not only sounds emitted by the instruments, but the rolling of carriages, the voices of the crowds, the rustling of the leaves of trees, and innumerable other noises, all clearly distinguishable.

The eye, it is true, can regard an extended view or a multiplicity of subjects, but its perception is successive; it glances quickly from point to point and thus embraces all, but the ear recognizes a number of sounds simultaneously.

To understand the theory by which Professor Helmholtz explains the phenomenon, it is necessary to consider the oscillations of a pendulum. It is well known that a suspended body, even if of considerable weight, may be set in motion, by slight successive impulses, provided the latter be properly timed. These impulses must be repeated at equal intervals, and, in the case of a pendulum, act in the same direction as the movement of the body, determined by gravity, which is the motor force. Otherwise their effect will be to stop the motion rather than to accelerate it. Hence the interval of time which separates two consecutive impulses must be equal to the duration of an oscillation of the pendulum or to a multiple of such duration. Suppose a number of pendulums of different lengths be arranged in regular succession in the same vertical plane, as shown in the accompanying diagram. With a rigid horizontal rod, imagine



the experimenter to strike all these pendulums in some particular rhythm. It is evident that such pendulums of which the times of vibration are equal to the interval between two successive blows, or to a submultiple of such interval, will oscillate. To all others the cadence of the rod will be in opposition, and they will hence stop and remain at rest. The same result takes place if sonorous cords, each having its own duration of oscillation, be substituted for the pendulums. Suppose that in the internal ear a great number of nervous fibers exist, the movements of which correspond to a determinate impression for each one. If the liquid vibrates during a certain period all the fibers having a corresponding time of oscillation will be set in motion; and a combination of impressions will result, peculiar to a given vibration, and different for any other. Such in brief is the theory by which Helmholtz explains the perception of simultaneous sounds, harmonies, the production of beats, and in fact all the phenomena due to audition. The probability of the truth of this view is strengthened by the fact that the internal ear does contain a great number of organs which appear to be suitably disposed in order to serve as vibrating fibers. In the first edition of his work, Helmholtz believed that the nerve prolongations, known as the organs of Corti, fulfilled the purpose, but in subsequent editions he has renounced this idea, since Hasse has proved that the Corti fibers do not exist in amphibious animals. Among the membranes, however, in the interior of the inner ear, is one known as the basilar, which is ruptured with difficulty in a direction longitudinal to its fibers, while it yields readily to force applied in a perpendicular direction to the same. Helmholtz now considers the fibers of this membrane to act as a series of juxtaposed cords, and the variation in the length of the fibers (since Hensen has proved that the breadth of the membrane increases from one extremity to the other in proportion of one to twelve) tends to confirm the hypothesis.

M. G. Guérolt, the French translator of Helmholtz' work, suggests that the Corti fibers may serve the purpose of dampers, but adduces no experiments or other proof in support of the idea. An exhaustive comparative examination of the auditory mechanism in various animals, by means of the microscope, would doubtless show which organs are everywhere necessary to audition. Besides, as there appears to be a relation between the auditory faculties and the pitch of the voice of animals, the detailed comparison of the ears of those having deep voices with the similar organs of others having voices of a high pitch would probably elicit curious and valuable results.

THE AQUARIUM.

One of the first principles, in constructing a tank for an aquarium, is to give the water the greatest possible exposure to the air. The simple rectangular form is the best. This is generally constructed of iron and glass; the iron should be japanned, and the glass be French plate, to insure brilliancy and strength. The breadth and hight of the tank should be about one half of the length. Cheap tanks can be made of wood and glass, the frame and bottom being of wood, and the sides of glass. In order to make the joints watertight, care must be taken to get a proper aquarium putty or cement. The following is a good recipe: Put an eggcupful oil and 4 ozs. tar to 1 lb. resin; melt over a gentle fire. Test it to see if it has the proper consistency when cooled; if it has not, heat longer or add more resin and tar. Pour the cement into the angles in a heated state, but not boiling hot, as it would crack the glass. The cement will be firm in a few minutes. Then tip the aquarium in a different position, and treat a second angle likewise, and so on. The cement does not poison the water. It is not advisable to make the aquarium of great depth; about eight inches of water is sufficient. In regard to the light, great care must be taken. Too much often causes blindness, and is a common source of disease. The light fish receive in rivers comes from above; and an aquarium should be constructed so as to form no exception to this rule. All cross lights should be carefully avoided, at least if the light is very strong. Never place the aquarium in front of a window so that the light passes through it; for, when viewing an aquarium, the source of light should come from behind us. Not enough light is as injurious as too much, and causes decay of the vegetation. Having constructed a watertight aquarium, the bottom is strewn over with clean sand to the depth of 1 to 3 inches, on this a little gravel is spread; then a few stones or rockwork. Heavy large rocks should be avoided; they displace a large amount of water and increase the danger of breaking the glass sides. Pumicestone, well washed, is the best kind, being light and with a rough surface suitable for the rooting of plants, etc.; and if fancy forms are desired (bridge work, etc.), the pumicestone can be cut quite easily to the desired shapes. The plants are rooted in the sand and the vessel left at rest for a week for the plants to vegetate. The following plants will be found useful: *Utricularia inflata, utricularia vulgaris, myriophyllum spicatum, anarcharis Canadensis*, and *hottonia inflata.*

In obtaining plants, procure all the roots and see that they are well rooted. If fungus should form, add snails (*planorbis trivolvis*); they will completely destroy it. After the plants are well started, add the shells and amphibious animals. The following shells will be found desirable: *Planorbis trivolvis, physa heterostrapha, unio complanatus.* Many shells are not needed. Snails act the part of scavengers; and where the different elements of an aquarium are rightly balanced, two or more snails will be found sufficient.

If amphibious animals are introduced, the rock work must extend above the surface of the water, or a float of some kind must be substituted. It is impossible for them to live under water all the time, and they would die without some such arrangement.

The turtles claim first rank. The *enys punctata*, or spotted water turtle, and the *chrysemys picta*, or painted water turtle, will be found to be the best for the aquarium, and should be procured when very young, as they are very destructive when old. The tritons (*triton tigrinus, triton niger*), the red salamander, the cray fish (*astacus Bartoni*), are all suitable, and present a very odd and yet a very natural look to the aquarium.

In selecting the fishes, there is no boundary to the number to be obtained, but experience has proved that comparatively a few only thrive in confinement. Among these, and the first, is the gold fish. He can live for months without introduced food, and is, without comparison, the most hardy, standing remarkable changes in the temperature; and he is the most gaudy and attractive. A large number of the fishes prey upon each other, and will only do for the aquarium when in the young state. Among these may be mentioned *pomotis vulgaris*, or sun fish, *esox reticulatus*, or common pickerel, and *perca florescens*, or yellow perch. The *leucis cus pygmæus*, or rock fish, is a great addition, and is found very plentifully in our streams. The *pimelodus atrarius*, or common black catfish, is another worthy of a place. So also is the *hydrargia diaphana*, or transparent minnow. But few fish can live in an aquarium; and the needless crowding together, so often seen, is very hurtful to health, and causes sound, strong fish in a short time to become weak and poor. The great difficulty in keeping an aquarium is to secure enough oxygen for the fish. To a slight degree, it is the duty of the plants to supply this; but if too much vegetation be present, decomposition takes place and ruin follows. It has been demonstrated that only a small amount is necessary to absorb the carbonic acid given off by the fish and amphibians; consequently, if the water be daily aerated with a syringe, it will absorb an abundant supply of oxygen for the animal life, and the trouble arising from the decay of much vegetable matter will be lessened or altogether avoided.

THE PRACTICAL MAN.

He sat beside us in a street car. He looked over our shoulder at the new copy of the SCIENTIFIC AMERICAN, which, fresh from the press, was receiving our final scrutiny, and requested the loan of the paper for a moment when we had finished. He glanced at the first page, skimmed over the middle, and peeped into the inside.

"I suppose that paper interests a great many people," he remarked.

We modestly signified our assent, and murmured something about forty odd thousand.

"Wa'll, it does'nt me," he interrupted sharply. "I does'nt take no books or papers to learn me my business, you know. Never learned nuthin from books in my life. Didn't have but a quarter's schoolin, and then I went into the shop. Served my time with old Pete Reynolds, of Boston. You know'd him, mebbe; dead now. Was his foreman; now I'm boss of my own works in the city. I'm a practical man, I am. All yer hollergeys and hosserphys may do well enough to write about; but they ain't no sort'er use in the shop. They just git inter mens' heads, and set'em a thinkin about other things than their work, and then they git inventin', and that's the last of 'em. Why, I had a likely young feller, who used ter buy that paper, and read on it, dinner hour. Sometimes he'd stick it up on his lathe, until I stopped that, mighty sudden. Wall, one day I caught him scribblin' with a piece of chalk on a bit of board; then I know'd the invention fit had got hold of him, and that he was a goner. A few weeks after he comes to the office, and says he: 'Boss, I've got a little arrangement here that'll make the old lathe do better work,' and he out with one of them reg'lar printed paytents, and showed me a new attachment for making gearins, and sich. 'Wall,' says I, to humor him, like, 'sonny,' says I, 'you can go make yer masheen and set it up on the lathe, if yer wanter.' But the ungrateful villin began to say something about royalty and shop rights, and I told the book-keeper to pay him right off and let him clear out. Blow me if he did'nt go over to Smith's, acrost the street, and rig his affair there; and the first thing I know'd, Smith was turnin' out work at half my prices. Then I had to go find that feller, and pay him his blamed royalty, and a heap it was too.

"Now, there was a good hand just spiled by a-readin'; if he'd a let that ere paper of your'n alone, he might ha' been a good, stiddy man, gittin his three dollars a day comfortable and reg'lar. Now they say he's makin stamps by thousands, but he's spiled. Wont be worth nuthin ever fer work agin. Where'ud I have been if I'd pegged away at books and noozepapers—eh?"

Our practical friend did not wait for an answer; for while we were cogitating a suitable response, he suddenly made a bolt out of the car and rushed down a side street toward a dilapidated looking edifice, which, we conjectured, was none other than the "works."