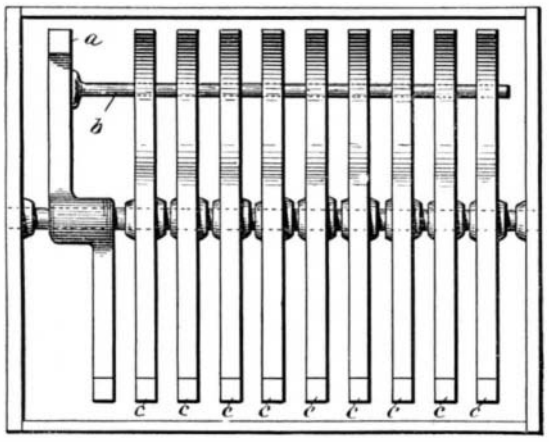
lug that is engaged by the lug on the proper key lever for that station when the latter lug is projected from the carrier. This engagement pulls on the chain and swings the receiver into operative position. A counterweight on the other end of the chain gradually falls in a closed tube and throws the receiver and its book out of the path of the carriers. As the sliding block descends, a weighted lever carried thereby passes a shaft and is thus forced against the key lever lug and disengages it from the lug on the block. The key levers are set for the proper station at the central station in the rotunda. The carrier comes to the central station on the part of the sprocket chains that is at the rear, and, after passing over the large wheels at the top, descends through a fixed inclined series of fingers down which the book slides to a desk. As all incoming books are left here, it is not necessary to make the receiving fingers movable. Below these fingers are a series of similar fingers that are inclined in the opposite direction, on which fingers the book to be sent to the stack is placed. The book is held from sliding down by a series of short fingers that are placed between the fixed fingers and that are mounted on a rock shaft. This rock shaft is linked to another rock shaft on which is splined a sleeve having an arm that carries a roller which sets the proper key lever by bearing against its upper end, this end being projected out in the act of releasing the receiver. These rock shafts are operated from another rock shaft above them that is turned by a lug on the pick up lever in the same manner as the key lever operates the receivers in the stacks. Thus, the roller is thrown out and sets the key lever at the same time as the book is delivered to the carrier. The position of the roller is determined by a finger which engages a groove in the sleeve and that is carried by a horizontal rack. The rack is shifted by a gear on a vertical shaft that is geared with a horizontal shaft carrying a handle over a dial with nine digits upon its face. In order not to set a key lever except when a book is to be sent to the stack, the vertical guide for the sliding block is hinged below and is allowed to tip back above, to be out of the way of the pick up. A movement of a handle throws the guide to the vertical position, where it is held by a gravity catch which is released on the upward movement of the sliding block.

The pick up is a lever having a lug at each end, the lugs being out of vertical alignment with each other. A long horizontal arm on the pick up passes behind the upper end of the key levers, so that, when any of the latter are set, the upper lug of the pick up is withdrawn, and the lower lug is projected.

The depositing in the stack is performed by a horizontally sliding tray composed of parallel, separated fingers and operated by a block sliding in a pivoted pair of guides like those used at central station for the same purpose. The carrier rises through these fingers and takes up the book, after which the counterweight carries the tray out of the path of the carriers. This




KEY MECHANISM OF BOOK STACK CARRIER.

throws in the upper pick up lug; and a fixed cam at central station, operating on the lower pick up lug, throws the upper lug again into operative position.

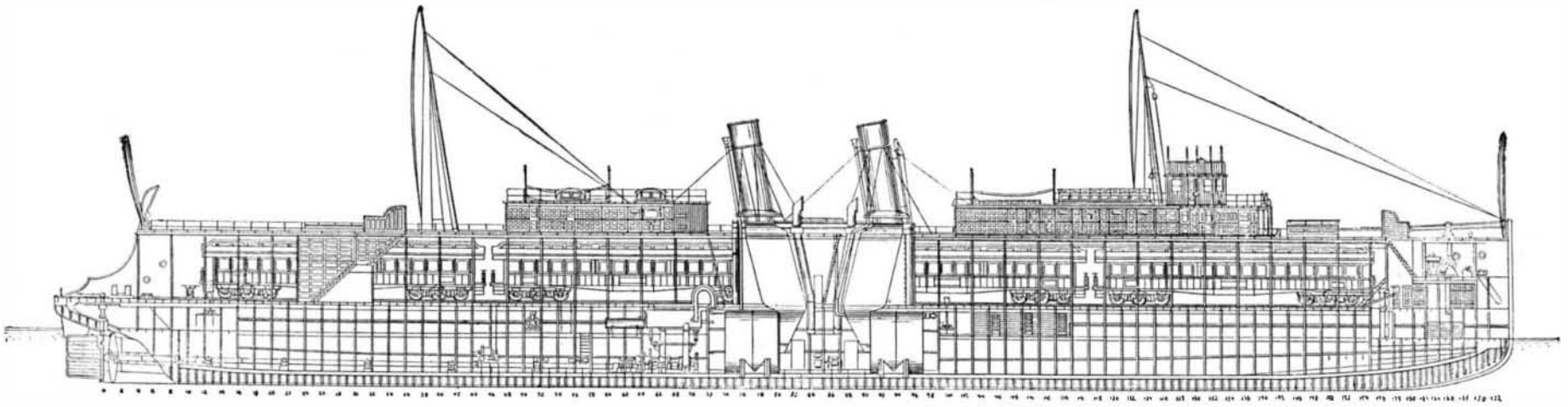
Pneumatic tubes similar to those used by cash carriers convey orders for this system and also for the system running to the Capitol.

The beautiful mahogany casing of the carrier at the reading room terminal is lined with asbestos so that no sound of the machinery may disturb the readers.

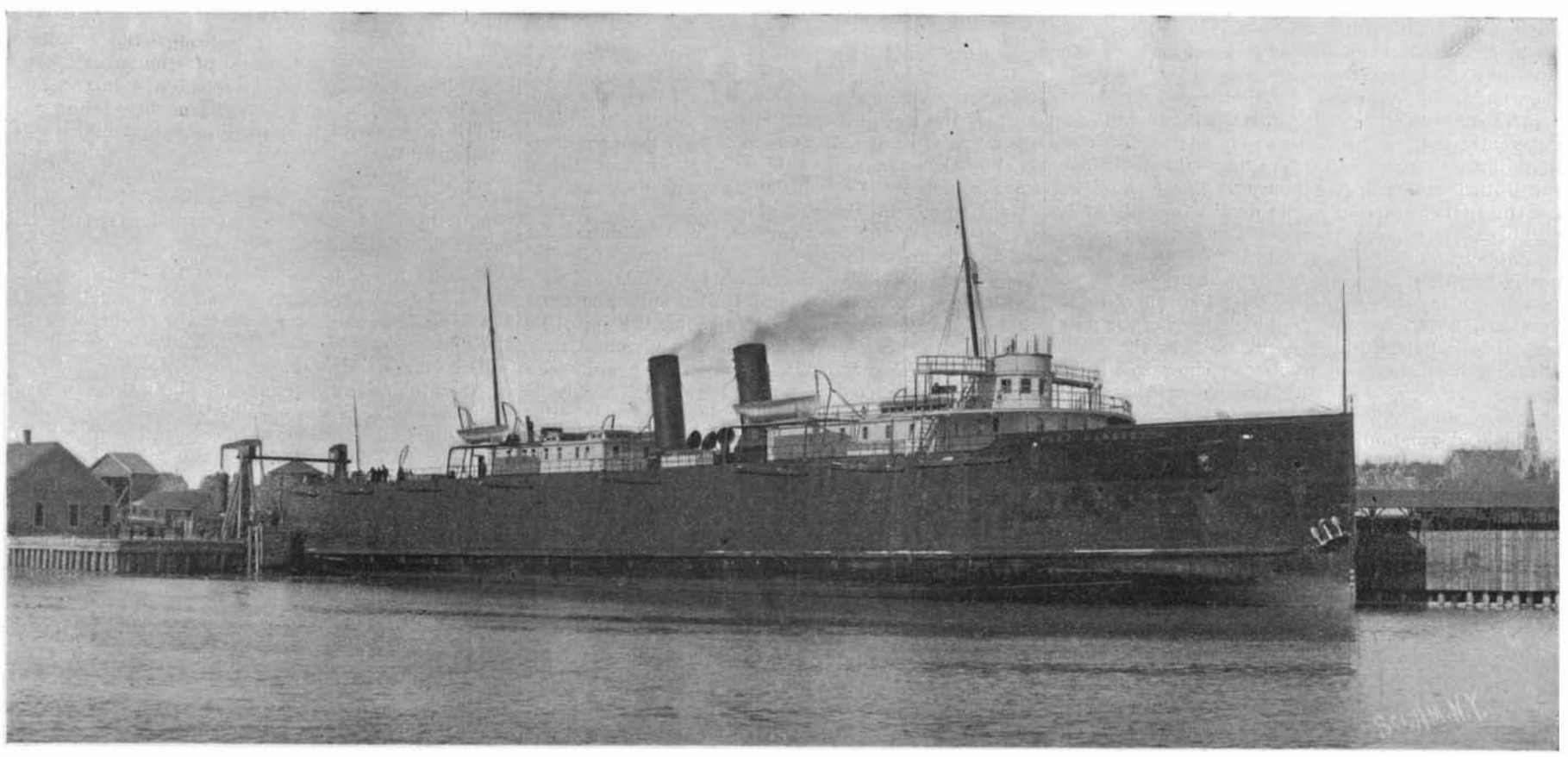
## THE SEAGOING FERRY "PERE MARQUETTE."

We present illustrations of the twin screw car ferry "Pere Marquette," which has been built for the Flint and Pere Marquette Railroad for transporting freight or passenger cars across Lake Michigan. She is considerably the largest ship of her kind afloat, and in respect of her seagoing qualities she is quite unique among the large ferries of the United States. Her dimensions are 350 feet long on deck, 56 feet in beam, with a depth from keel to upper deck of 36¼ feet. She has four tracks, with accommodation for thirty freight cars or sixteen full sized passenger cars.

The Flint and Pere Marquette Railroad runs from Toledo, Detroit, Flint, Saginaw, Bay City, through Michigan and up through the lower peninsula to Ludington. From the latter place a line of steamers runs across Lake Michigan to Milwaukee, Chicago, and Manitowoc. The new ferry has been built for service between Ludington and Manitowoc, a distance of about sixty miles. As she is intended to run continuously throughout the whole year, she has been given great strength and a special shape of hull to enable her to withstand the heavy weather and the crushing strains of the ice during the winter months. Accordingly the framing from below the turn of the bilge to the upper deck is built of 12 inch channels weighing 25 pounds to the foot; the frames are spaced 24 inches center to center; the keel is 48 inches in width and weighs 32½ pounds per square foot; the center plate keelson is 42 inches wide and weighs 25 pounds per square foot, and the floor plates are 30 inches deep at the center, weighing 20 pounds to the foot, and they are connected to the center girder by double angles. On each side of the center girder, and spaced 6¾ feet from center to center, are two continuous keelsons flanged to the shell plating and extending above the top of the floor. The whole of the material worked into the bottom construction of the vessel beneath the engine and boiler spaces is made specially heavy. The shell plating from the keel to the bilge weighs 25½ pounds to the square foot. There are two water line strakes above the bilge and the main sheer strake, the last being double; all of these weigh 30 pounds to the square foot. The plating between main and upper decks weighs 10 and 12½ pounds, and upper deck sheer strake weighs 15 pounds to the square foot. From the stem to about 35 feet aft, and from the keel to about 3 feet above the water line, the shell plating is double, and it is needless to add that the interior of



LONGITUDINAL SECTION OF THE "PERE MARQUETTE."



THE "PERE MARQUETTE" THE LARGEST SEAGOING FERRY STEAMER AFLOAT.

Deck length, 350 feet; beam, 56 feet; depth, 36¼ feet; capacity, 30 loaded freight cars or 16 passenger cars; speed, 16 knots.

the vessel at the bow is strongly reinforced with heavy bracing. The propeller shafts are protected by the plating of the hull, which is brought out and around the shafting so as to form a tube or sleeve.

The motive power of the "Pere Marquette" consists of two sets of compound engines, the cylinders being 27 and 56 inches diameter by 26 inches stroke. The high pressure cylinders are fitted with piston valves and the low pressure cylinders with double ported slide valves, and the Stephenson link motion is employed. Steam is furnished by four single ended return tube boilers, 15 feet 3 inches diameter by 12 feet long. The steam pressure is 135 pounds per square inch. The cabins are all placed on the upper deck, part of them being forward of the smokestacks and the rest being located aft, as will be seen from the accompanying drawing. In the forward cabin is a passenger saloon, 36 feet long by 10 feet wide, and ten staterooms. There is a smoking room measuring 10 feet 6 inches by 8 feet wide, with lavatory adjoining. The after cabin contains a dining saloon 16 feet long by 11 feet wide, and dining room for the officers and crew.

Except in regard to her stern, which is open after the fashion of all ferry boats, the "Pere Marquette" would readily be mistaken for an oceangoing steamship. The two pole spars and the raking smokestacks give the vessel a very handsome and seaworthy appearance, and her performance since she has been upon the lakes has been fully up to expectation. With a full load in open water she has more than once been driven at a speed of sixteen miles an hour. This is over three and a half miles faster than the contract speed. During the winter she has been put to some very severe tests. On one occasion she made the trip of sixty miles with thirty loaded freight cars aboard, in the face of a heavy gale which necessitated the other boat of the company putting back to shelter; and on more than one occasion she has pushed her way continuously through solid ice fourteen inches thick and maintained the speed of ten miles an hour. This, however, is not by any means the heaviest work that she will have to do, as it is not uncommon during a hard winter for the ice to be two or even three feet thick, and the heavy gales will frequently pile it up to a thickness of eight or ten feet. In making a landing, the "Pere Marquette" is taken in stern first, and the twin screws are used in the winter time to wash away the accumulation of ice in the slip.

This interesting vessel was designed by Mr. Robert Logan, of Cleveland, Ohio, and we are informed that the company is so well pleased with her performance that they intend to build a fleet of the same kind. We are indebted for illustrations and particulars to the builders, F. W. Wheeler & Company, of West Bay City, Michigan.

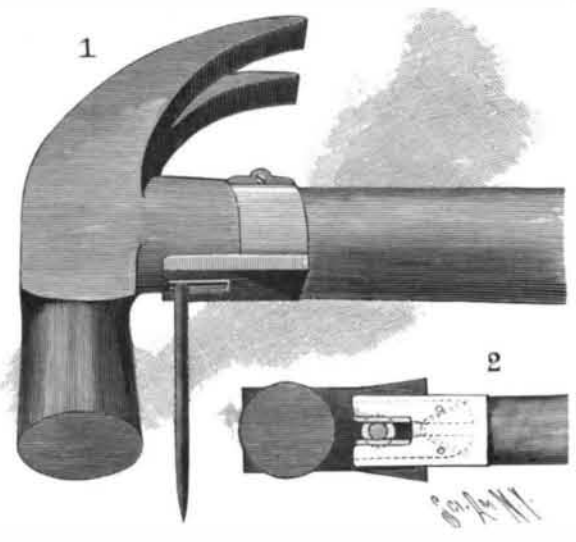
### Thunder, Lightning, and Fear.

A current news item, says the Electrical Engineer, gives the results of an investigation carried out by Dr. G. Stanley Hall, president of Clark University, on the things that most excite fear in people. Of the 298 classes of objects of fear to which 1,707 persons confessed, thunder and lightning led all the rest, although in certain localities, as, for instance, those subject to cyclones, etc., the fear of the latter predominates. It may be accepted as probably true that thunder storms constitute the most pronounced source of fear with the majority of people, due, no doubt, to the always impressive and not infrequently overpowering nature of the phenomenon. But is there any justification in fact for this fear so far as fatal results are concerned? We believe there is not, but on the contrary, that many other causes which barely have a place in Dr. Hall's list are infinitely more entitled to the distinction as fear producers than lightning. As proof of this we may cite statistics of the United States weather bureau. These show that for the four years 1890–93 the deaths from lightning numbered 784, or an average of 196 a year. Again, Mr. H. F. Kretzer, of St. Louis, found from the record of nearly 200 newspapers that for the five years 1883–88 there were 1,030 deaths caused by lightning, or an average of 206 a year. We doubt whether, of the number of deaths classed as "accidental" in the whole United States, any one group can show so small a number. In New York City alone over 200 people are drowned every year, while nearly 150 are burnt or scalded to death, and close on to 500 persons meet their end by falls of one kind or another. Comparing the record of 200 lightning fatalities for the whole country with the above records for New York City with its total of nearly 1,500 accidental deaths every year, it will be seen how groundless is the popular fear of lightning. It is a survival, an inherited superstition.

But there is another point in connection with this matter which ought to be particularly comforting to city dwellers, albeit country dwellers may not be affected in like manner, and that is, that statistics show that the risk of lightning is five times greater in the country than in the city. The cause of this immunity for city dwellers is not far to seek. It is doubtless due to the predominance of metal roofs, the well grounded water pipes in houses, and probably as much as anything to the protective network of overhead electric wires of all kinds. The popular belief that a stroke of lightning is invariably fatal is also not borne out by facts. Indeed, one record specially devoted to this feature shows that of 212 persons struck, only 74 were killed. Taking it all in all, there seems to be no more groundless popular fear than that of lightning. Indeed, if one can go by statistics, the risk of meeting death by a horse kick in New York is over 50 per cent greater than that of death by lightning. Yet with all the weight of statistics against its deadliness, lightning will probably continue to scare people as heretofore. Perhaps, after all, there may be a more direct cause than the mere psychological one usually ascribed to it, and that is the fact that many people of nervous temperament are affected hours before the approach of a thunder storm and thus rendered particularly powerless to stand the strain which more or less affects even the most phlegmatic natures during a disturbance in the heavens.

### A NAIL HOLDING DEVICE FOR HAMMERS.

An attachment to carpenters' hammers, for placing a nail in the position where it is to be driven, is shown in the accompanying illustration, the hammer and its attachment being then disconnected from the nail and the latter driven in the usual way by the use of the hammer. The improvement has been patented by Albert R. Treat, of No. 1333 De Long Street, Los Angeles, Cal. Fig. 1 represents the application of the device and Fig. 2 is a bottom plan view. It comprises a clamp and a jaw-holding casing, preferably formed from one piece of metal, the clamp opening sufficiently to be passed over the handle, close up to the shank of the head of the hammer, where it is secured in position by a screw. Within the casing, and extending at




TREAT'S NAIL HOLDER FOR HAMMERS.

the side of and over a slot in its bottom face, are two pivoted jaws, normally held closed by a spring, these jaws engaging and holding the nail head as it is slipped into the slot, as indicated in Fig. 2, and the nail head being thus held between the jaws and the shank of the hammer head. With the nail held in such position it may be readily started in the surface where it is to be driven. The spring and jaws being entirely within the casing, there are no parts of the device liable to catch in the workman's clothes.

### Dogs for Attacking Military Cyclists.

It is stated in the German papers that an attempt is being made in some garrisons to train dogs to attack military cyclists. Since the cycle was introduced into the army, German officers seem to have been considering how the advantage could be neutralized, and they have come to the conclusion that the dog, a Great Dane by preference because of his weight and strength, is the best instrument to employ. The training of the animals is going forward in the garrisons of Berlin. They are taught in the first place, it is said, to distinguish German, Austrian, and Italian uniforms from those of French and Russian soldiers, and when their education in this respect is sufficiently advanced, they are taught to throw themselves upon the cyclists who wear the uniform of the supposed enemy. The Avenir Militaire says that cruelty is employed in their training, in which the whip plays a large part. Cyclists clad in various uniforms, and so guarded by padding that they are protected against bites, ride past or among the dogs, and these instantly rush at men costumed as Frenchmen or Russians, and throw them over. If by any chance a dog should attack a representative of the triple alliance he is severely whipped, while a reward is given him when he assails the man who personates an enemy. Here, we are told, is the whole secret of the training. German officers believe that a small number of dogs would rapidly dismount a scouting party of cyclists, and they dread the employment by the enemy of dogs for this work, fearing that in this case the animals might fight among themselves, and losing their sense of distinction between friends and foes, might attack the former. The Avenir Militaire urges French officers to take up the work of training dogs for this guerre aux cyclistes.

### Science Notes.

Mr. Douglas, of Harvard College Observatory, has determined the period of rotation of Ganymede, the third satellite of Jupiter. He proves it to be 7 days, 5 hours, that is, nearly equal to its period of sidereal revolution. This confirms the statement of Herschel, that the satellites of Jupiter always turn the same face to their planet as the moon does to the earth.—Revue Scientifique.

Rinderpest being a cattle disease, Dr. Koch has found out that it does not attack birds. He tried to inoculate hens, pigeons, guinea fowls, a crane, an eagle and a secretary bird with the bacillus of the disease, but it did not affect them. He was equally unsuccessful with dogs, mice, rabbits and guinea pigs, but is not sure that the disease may not be conveyed to cattle by any of these animals.

The town council of Berlin have, by the advice of Prof. Virchow, decided to appoint a municipal hydrologist, whose duty it will be to supervise the Berlin waterworks in the interest of public health. In Paris the water supply is becoming a serious question, especially in view of the coming exhibition. The consumption has been steadily increasing for some years, and the authorities are busily engaged in the consideration of schemes for securing an adequate supply in the future.

According to the Revue de l'Electricité, birds are provided for in a wonderful way by nature. It may be noticed that their plumage is always tidy, no matter how rapid their flight may have been a moment before the time of our observing them. This, says the French paper, is due to the feathers being electrified positively, the down negatively by the air, so that the attraction between them makes them cling together in their place. This is very interesting, if the statement can be substantiated.

An inhabitant of the Scilly Islands was struck by the fact that the rats there seemed to prosper greatly, although the place is very barren. He resolved to investigate the cause of this, and digging up some of the nests by the seashore, found that the rats had dragged crabs into their holes, and, in order to prevent their escape, had bitten off their legs. No doubt the prey had been seized at low tide and brought home, to be stored up there by the original device just described.—Der Stein der Weisen.

Nitrate of lead is the cheapest disinfectant known that fulfills its intent. It does not, however, prevent putrefaction. The chloride of lead is much more effective in all directions. It is made by dissolving a small teaspoonful of the nitrate of lead in a pint of boiling water; then dissolving two teaspoonfuls of common salt in eight quarts of water. When both are thoroughly dissolved, mix the solution. When the sediments have settled, you have two gallons of clear fluid, which is a saturated solution of chloride of lead in water. A pound of nitrate of lead will make several barrels of the liquid and cost fifty cents retail.

Dispatches from Tacoma, Wash., dated August 3, say mail advices give further particulars of the great eruption of Mount Mayon in the Philippines, which began on June 26. This volcano is in the southern portion of the island of Luzon. It was said at first that fifty-six persons lost their lives and many more were injured, but the latest advices at Hong-Kong from Manila place the loss of life to July 1 at fully 500. It was believed in Manila that the loss would be much greater before the volcano subsided. The flourishing towns of Malipot, Bacay and Libog were partly or wholly destroyed, and lava was still pouring into them. Many small hamlets and valleys at the foot of the mountain were certain of destruction, and it was considered no less certain that many of the rural population would be caught by the falling ashes and running red hot lava before they could get out of danger.

A series of geological lectures lately delivered in Boston by Mr. Grabau possessed the special value of throwing light, according to the most recent investigations, upon the feature of consolidation which peculiarly characterizes the conglomerates in some parts of New England, which have long been the subject of scientific study. This consolidation the lecturer finds to be due, in many cases, to the cementing together of sand and pebble by the carbonate of lime, silica or oxide of iron present in the water—a process even now going on, in many places, in the sediment deposited at the mouth of rivers or on the sea coasts, where the water contains an abundance of these materials. Of this formation are the sandstones, pudding stones and freestones, which occupy so important a place in modern construction, their value for this purpose varying with their resistance to the action of the atmosphere, which depends upon the nature of the cementing principle holding the mass together; some of the pudding stones are so resistant to the atmosphere that ages have not disintegrated them, due to the presence of felsite pebbles and a clay cementing substance. The great necessity, in laying these stones, of observing their lines of stratification has only within a few years been appreciated by builders.