BLOWING OUT OF THE EAST CAISSON OF THE EAST RIVER BRIDGE.

[From the Report of the Chief Engineer.]

In the original design for the caisson it was the intention to make the air chamber one vast unbroken space, without dividing or supporting frames of any kind, reliance being placed upon the solid timber platform of 15 feet thickness to transfer all strains equally from the shoe inward. To diminish the work above, the masonry was to be built inside of a wooden cofferdam placed on top of the caisson.

This programme was quite feasible theoretically, provided the air pressure could be maintained at the proper standard without possibility of failure, and provided the caisson was sunk through a soft uniformly yielding material. The shoe and sides of the caisson were made strong enough to resist the overweight occurring at each low tide.

The requirements of launching however, make it necessary to introduce five heavy trussed frames to serve as launching frames; they divided the caisson into six chambers, each frame being also well braced from the sides. These frames were allowed to remain in, large openings being cut in them for passage to and fro.

Subsequent events proved the necessity not only of these frames, but of double the additional support.

Very little attention was paid to the matter of supports at first; any irregular bearing below was easily distributed by the roof, even to the extent of having entire frames unsupported at a time. The wooden blocking on which the caisson was supported, proved sufficiently elastic to yield without crushing to any extent.

As the caisson sank deeper much of the dirt coming out was dumped on top of it, filling up all spaces not occupied by masonry. This was only the beginning of the overweight to be carried ultimately. Again, at very low tides, the overweight caused by them was equal to the weight of a volume of water 168x102x7 feet, amounting to 3,700 tons alone. This overweight kept slowly increasing until, one Sunday morning about 6 A. M., the south water shaft blew out, every particle of compressed air leaving the caisson in an instant. To say that this occurrence was an accident would certainly be wrong, because not one accident in a hundred deserves the name. In this case it was the legitimate result of carelessness, brought about by an over confidence in supposing that matters would take care of themselves. The immediate cause of the blowing out lay in the washing away of the dam around the pool under the shaft. These dams washed away frequently at subsequent periods, but we had had our experience and our lesson, and were prepared for it. There was, unfortunately, no man in the caisson at the time, so that that experience is lost. Eye witnesses outside state that a dense column of water, fog, mud, and stones was thrown up 500 feet into the air, accompanied by a terrific roar and a shower of falling fragments, covering the houses for squares around. This column was seen a mile off. The noise was so frightful that the whole neighborhood stampeded and made a rush up Fulton street. Even the toll collectors at the ferry abandoned their tills. There were three men on the caisson at the time, including the watchman. He reports that the current of air rushing toward the blowing water shaft was so strong as to knock him down; while down he was hit in the back by a stone, and further than that he does not remember. One of the other men jumped into the river, and a third buried himself in a coal pile. It was all over in a minute. Both doors of the air lock fell open. The dry bottom was visible through the air and water shaft; not a particle had entered under the shoe into the air chamber, and for the first and only time the caisson could dispense with artificial illumination. As soon as possible a stream of water was passed into the shaft from above, the locks were closed, and in the course of an hour the pressure was restored to fifteen pounds, corresponding to a head of thirty-one feet.

The first entry into the caisson was made with considerable misgivings, but none of our fears were realized.

The total settling that took place amounted to ten inches in all. Every block under the frames and posts was absolutely crushed, the ground being too compact to yield; none of the frames, however, were out of line. The brunt of the blow was, of course, taken by the shoe and sides of the caisson. One sharp boulder in No. 2 chamber had cut the armor plate, crushed through the shoe casting and buried itself a foot deep into the heavy oak sill, at the same time forcing in the sides some six inches. In a number of places the sides were forced in to that amount, but in no instance were they forced outward. The marvel is that the air tightness was not impaired in the least.

The nine courses of timber forming the sides of the air chamber were permanently compressed to the extent of two inches, as was shown by protruding bolt heads and the shearing off of a number of diagonal bolts. The lower sills of the frames were also torn where they came upon boulders.

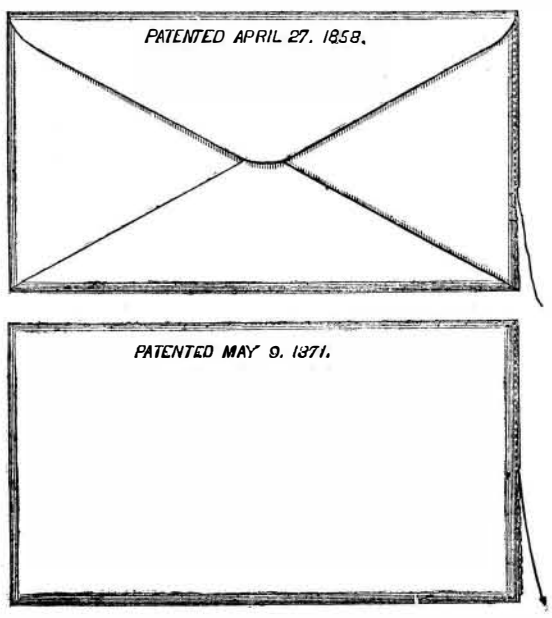
The weight of the caisson at the time was 17,675 tons. The air blew out so suddenly that this weight must have acted with considerable impact in falling through the space of ten inches. The bearing surface at the time was as follows: The four edges of the caisson, 550 feet long and seven inches wide, amounting to 322 square feet; the five frames each 100 feet long and one foot wide, resting on twelve blocks one foot wide, amounting to sixty square feet and giving a total of 382 square feet to meet the above pressure. This at the rate of forty-six tons per square foot.

But more than one half of the shoe was undermined to a depth of one foot or more, which reduced the practical bearing surface by nearly one half. At the commencement of the shock there was therefore a pressure of eighty tons per square foot, no allowance being made for impact, which may have doubled this rate. The caisson had settled ten inches. The shoe had buried itself so as to present a width of twelve inches, and through the crushing of the blocks the frames were in many places resting bodily on the ground. The settling had therefore stopped when a bearing surface of 775 square feet had been reached, giving a pressure of twenty-three tons per square foot.

VAGARIES OF THE PATENT OFFICE.

It will be seen from the following that the ever popular inquiry as to the difference between tweedledum and tweedledee has been adjudicated by the Patent Office, and that a patent has been granted for the difference.

In 1858 Charles Phelps, of Salem, Mass., obtained a patent for a letter opener, consisting of a thread placed in the crease of the envelope, as shown in the upper figure of our engraving. To open the envelope, you pull the thread so as to make it cut the paper. His claim, which is a good one, appears to cover the whole subject, and is as follows:



"I claim the application to a letter envelope of an opener therefor, said opener to be attached to, and form part of, said envelope, and to be attached and operated substantially in the manner set forth and described."

The unsophisticated mind would naturally suppose that whether one selects a thread from a spool or a knotted thread from a lady's needle, involves no perceptible difference; but the Patent Office regards the subject from a more profound point of view. If the reader will take a magnifying glass and closely scan the second figure in the cut, a small knot will be discovered on the extremity of the thread, for which knot a patent was granted to Henry K. Gregg, of Baltimore, Md., May 9, 1871. He claims an envelope made with a cord imbedded wholly in the inside of the end or side there of, providing the cord with one or more knots on either or both ends thereof, substantially as and for the purposes described.

FLYING MACHINE.

Somebody has defined man to be a species of featherless birds. The inventor of the device illustrated herewith has aimed to supply our natural deficiencies in this respect by

the provision of wings and tail, attached and operated as indicated. We hardly think he will be able to compete with the swallows in this harness, and would advise him to start from some low point at first, so that, if he should fall down, it will not hurt him much. However, we may say that the principle of calling into play the strong muscles of the thighs to aid the arms in the movement of wings, as shown, is taking advantage of the greatest power the human body can exert, and in this respect the device is an improvement upon some other attempts. The method of connecting the rope to the various parts of the wing, is also such as gives least strain to the various parts. The machine is the invention of W. F. Quimby, of Wilmington, Del.

Resources of the North-west.

Says the *American Exchange and Review:*

Puget Sound, on the borders of which will be the future metropolis of the North Pacific coast, is an inland sea, dotted with islands, and joined to the Pacific by a gateway called the Strait of Fuca, 80 miles in length, 10 to 12 in width, and from 20 to 100 fathoms deep in all its parts. One arm of the sound extends northward from where it joins the strait, and the others southward; both divide and ramify, until the sound, with all its bays and deep water inlets, presents a shore line of 1,833 miles, and extends across two degrees of latitude. There is no obstruction at the entrance. The mouth of the strait is easily entered in all weather. For 150 miles the mid channel is more than 300 feet deep, and remarkably free from all hidden dangers. On each side of the main channel, and in the various bays which will be the real harbors and shipping ports, the water is still deep, but not too deep for anchorage. The holding ground is excellent. The waters abound with fish of great variety and excellence. The cod banks of Alaska are now known to be as extensive and productive as those of our Atlantic coast. These fisheries are necessarily tributary to the trade of Puget Sound. Besides, the climate of Washington territory offers for curing fish just the required medium of temperature—an average of 40 degrees in winter and 62 degrees in summer. The fisheries are 800 miles nearer the drying racks and the shipping ports of Puget Sound than to those of San Francisco. These advantages will govern the location of the fishing trade. The best whaling ground left to American harpooners is within eighteen days of the western terminus of the Northern Pacific railroad. The basin containing the Sound and its branches is bounded on the east by the cascade range of mountains, and sheltered on the west by the Olympian or Coast range. This depression between the two mountain ridges is about 75 miles in width, and that part which is not occupied by the waters of the Sound is mainly covered with magnificent forests, which extend to the very summit of the mountains. Here grows that Puget Sound timber of which so much has been written—fir, cedar, pine, spruce, hemlock, oak, maple, cotton wood, ash, dog wood, alder, and some of the smaller varieties. The forests of giant fir and cedar are traversed by ten rivers, which flow down from the Cascade mountains and empty into the sound, furnishing ten alluvial valleys of agricultural land, and supplying for logging purposes another thousand miles of inland shore-line. In connection with the remarkable climate (in which twenty varieties of flowers are known to be in bloom at the begining of January) the productive capacity of the soil of the Puget Sound region is great, both as to quantity and quality. Puget Sound is no exception to the wheat yield of the Pacific slope. All the other cereals are grown to perfection; oats are particularly plump and heavy. The small grains are at home in Washington territory. Pork is usually fattened upon peas, wheat, and barley, and, it is claimed, can be made as cheaply as upon corn in the Western States. Fruits of all kinds, except the peach and the grape, are raised in great profusion. Oregon and Washington apples are exported to San Francisco. Potatoes and other vegetables, grown on the north coast, are also in high favor in San Francisco market. The turnip yield will be most abundant.

Electrical Shadows and Images produced by Electricity.

In a paper contributed to the *American Journal of Scienc, and Arts,* Professor Arthur W Wright, of Williams College admits the possibility of the impression of outline images of objects upon the surfaces of other objects, and accounts for these singular phenomena as follows;

The formation of the electrical shadow, discussed in my former paper, as has been suggested by Mr. C. F. Varley, who has more recently obtained results similar to those there described, appears to afford a satisfactory explanation of a singular and very interesting phenomenon, which has occasionally been observed in the case of objects struck by lightning, especially of persons killed by it. A number of instances are on record where the person struck was found to have, impressed upon some portion of the body a delineation of some thing near him at the time of the stroke, and a similar effect has been noticed, also, in the case of inanimate objects. Dr Franklin mentions an instance in which an exact representation of a tree was imprinted upon the breast of a man, who was standing near it when struck by lightning. A number of similar and very remarkable cases are cited in a paper presented to the Royal Society of England, by M. Andrés Poey director of the observatory at Havana.

Mr. Varley also mentions cases, reported by sea captains, of images of certain brass numbers, attached to the rigging of a ship, being printed by the lightning upon the body of persons killed by it, and supposes the brass numbers to have acted as a negative pole in respect to the person struck. But it is unnecessary to suppose that the discharge in such cases always proceeds from the object delineated, and many of the instances recorded forbid such a supposition. The experiments in the production of the electrical shadows show that it is merely necessary that the object should interrupt the lines of action of the electricity, and that it may be at a considerable distance from the electrified cloud, the chief and indispensable condition being that the latter should be negatively electrified. We should then have the body, exposed to the lightning, perfectly electrified by induction, and, as the tension became sufficient, the dark discharge accompanied by the glow would take place, followed by the lightning stroke. If, then, any object should be in the path of the discharge, its image would be formed in the glow, and this might, in rare cases like those recorded, be sufficiently intense to leave a permanently visible impression.