THE TRANSIT OF MERCURY AND THE INTER-MERCURIAL BODY.

The observations of the transit of Mercury across the sun which were conducted at the various astronomical observatories throughout the country on May 6 yield varying results, the planet in some instances being apparently found to be ahead and in others behind predicted time. A large number of excellent photographs were, however, obtained and by the aid of these and a comparison of the data determined in various localities reliable results will probably be reached. At the Naval Observatory in Washington, Professor Newcomb found that the planet came into view twenty seconds ahead of the time predicted by Leverrier and more than a minute ahead of the American table. The statistics are as follows: Internal contact at ingress, from Leverrier's tables, 10h. 4m. 53sec.; observation, 10h. 4m. 38sec. Internal contact at egress, from Leverrier's tables, 5h. 34m. 17sec.; observation, 5h. 33m. 51sec.

The object of observing the transit of Mercury is altogether different from that sought in observing the transit of Venus. In the latter case the aim was to determine the sun's distance from the parallax, and to this end the observations were made from localities on the earth's surface where the latter was greatest. Mercury is situated at a much greater distance from the earth than Venus, and its orbit is smaller, while it is so difficult of observation that the position of its orbit is very imperfectly known, a fact indicated by the difference above noted between Leverrier's and the American tables. Now, if accurate data relative to this orbit can be obtained, in such lies the determination of the question of the existence of the alleged Vulcan or inter-Mercurial planet. It will be remembered that by observing the perturbations of Uranus, Leverrier reached the conclusion that the same could not be produced save by the influence of some undiscovered planet, and assuming the existence of this body he calculated its position, and on pointing his telescope to the point in the heavens where his calculations led him to believe it would be found he made the magnificent discovery of Neptune. Reasoning analogous to this induced him always to believe in the existence of some body which causes the perturbations of Mercury. He found that the perihelion of that planet advances much more rapidly than can be accounted for by any definitely known disturbing cause. In other words, as the planet sweeps around the sun in its nearly circular path and reaches the point nearest the sun (the latter being eccentrically placed as regards the orbit), it advances about 246 miles, or one thirteenth of its diameter, at each recurring revolution. As the planet approaches its aphelion the effect of a large motion of the perihelion would be to cause the planet to be further advanced in its orbit, and hence the time of transit would be hastened, and this would point to the existence, or rather tend to confirm Leverrier's hypothesis, of some unknown attracting matter exerting an influence.

That this result has been realized by the observations of Professor Newcomb is evident from the foregoing figures, and the same appears to be true from most of the uncorrected data telegraphed by other observers throughout the country to the daily journals.

Of course, admitting the probable presence of an undiscovered attracting body to be substantiated, it by no means follows that that body may be the imaginary Vulcan. It may simply be an aggregation of meteoric masses, or matter existing in the corona and protuberances of the sun itself.

The observations of the total solar eclipse of July 29 next will perhaps shed some light on this last possibility, and may even be the means of revealing Vulcan, if it exists, as one of our correspondents, who has made that supposititious planet the object of much study, published the fact some time ago that Vulcan ought to be quite near the sun at the time mentioned. Meantime, in order to know exactly how far the results of the recent observations tend to substantiate the conclusion indicated, it will be necessary to wait until the astronomers at the different observatories make their comparisons and final corrections, which will probably occupy considerable time.

OUR NAVAL NECESSITIES.

The New York *Tribune*, in an editorial on a "new navy," points out the inefficiency of our present marine, and advocates its rehabilitation in a general way singularly free from practical suggestions. Speaking of our numerous small vessels our cotemporary says: "Let us have a well considered system of replacing them by the best men-of-war that can be built, on patterns suited to our peculiar needs." If the *Tribune* will kindly indicate what manner of system it knows of that will afford the "best men-of-war," it will do the country a genuine service, and possibly settle a problem on which millions have been expended by foreign nations, and which seems no nearer solution than at the outset.

Out of 150 vessels borne on our Navy Register it appears that but 29 are suited for general cruising purposes. To these last the *Tribune* urges the objections that they are not iron clad, not heavily armored, and are merely thin "iron pots," besides being contemptible in the eyes of third rate European powers. All this is true enough, and it might be added that we have spent enough money in tinkering these inefficient hulks to have purchased a powerful ironclad fleet; but then it by no means follows that such a fleet should have been organized, or that the same is now necessary. We do not defend the waste of national funds which might much better have been left in the pockets of the taxpayers, but supposing we had constructed an iron fleet in answer to the demands that have been renewed by the *Tribune* and those who share its opinions about every year since the war, how much better off would we be? We built one ironclad fleet of monitors. Most of them are in the scrap heap, and the rest are rapidly gravitating thither. Their laminated armor is as pregnable to heavy modern projectiles as so much wood. We launched several very expensive and presumably swift cruisers, and in our anxiety to make them fast we gave them so much machinery that it was scarcely practicable to stow their coal, berth their crew, or accommodate their guns. Several of them were speedily consigned to the limbos of Navy Yard Rotten Rows.

Fortunately we proceeded no further, for had we followed England's example the outlay might well have been enormous. We should have had a fleet of Warriors, another of Minotaurs, of Captains, of Glattons, of Inflexibles—each in turn as one type of vessel superseded the other, and each probably in answer to such demands as that of the *Tribune* for the "best men-of-war that can be built." Each also in turn would have been discarded, and now, instead of complacently profiting by her immensely expensive experiments, at no cost to ourselves, we should be sharing with England the unenviable possession of a vast fleet and the annoying consciousness of its inefficiency.

The *Tribune* greatly underrates the productive ability of our people when it asserts that a "navy cannot be improvised in time of danger," and at the same time shuts its eyes to already demonstrated fact. With an improvised navy we maintained and compelled respect for the most extensive blockade ever known, despite the utter negation of its possibility by foreign military authorities. The improvised Confederate rams and our own hastily built gun boats alike did splendid service. We improvised the revolving monitor turret, the only really efficient system of ironclad ever contrived, and so revolutionized the naval armaments of the world. We improvised fixed and movable torpedoes, and for the first time demonstrated the enormous capabilities of the weapon which is chiefly to decide all future conflicts. This was done with the genius of the country divided against itself.

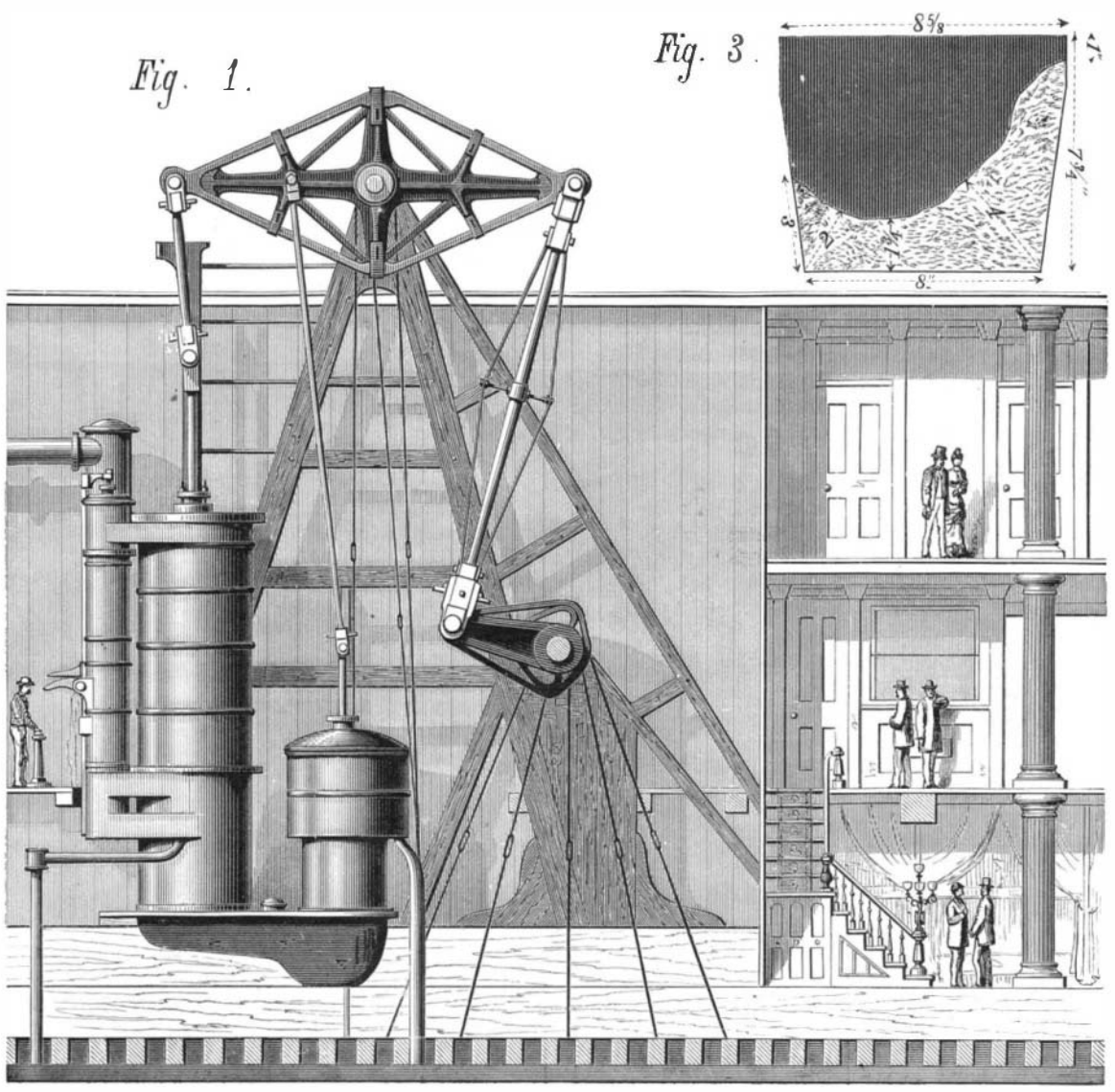
In our present navy, though it is small and inefficient, we have a reliable nucleus for as great a one as we choose to organize; and we possess the best and most skillful torpedo service in the world. A few staunch cruisers might, perhaps, profitably supplant some of our older vessels, but we see no present necessity for any further change in our naval status. The necessities of future wars may safely be left to the inventors.

THE ACCIDENT TO THE MACHINERY OF THE STEAMER OLD COLONY.

Since last summer, three New York steamboats have been disabled by the breakage of their engines—the Harlem, the Dean Richmond, and the Old Colony. When the Providence, one of the very largest and finest steamers plying on the Sound, was "laid up" for the winter, a flaw was discovered in one of the main journals of the paddle shaft to be so serious as to make a new shaft necessary before recommencing the coming summer trips between this city and Fall River. In every one of these cases flaws in the wrought iron were indisputably apparent, undoubtedly the cause of fracture, and in the three first mentioned were attended by a marked crystallization of the iron. We referred to the breakage of the working beam of the Harlem at the time of the occurrence, and spoke of the flaw and crystallization at the point of fracture in the lower strap, and of the good fibrous iron in the upper strap. When the accident occurred to the Dean Richmond, the connecting rod broke first, afterwards the beam and other parts; it was then that a very extensive flaw appeared in the center of the connecting rod, which extended to within a few inches of the circumferential surface.

Fig. 1.

Fig. 3.



MACHINERY OF THE OLD COLONY—BEFORE THE ACCIDENT.

From the accompanying illustrations and description it will be seen that exact information has been obtained respecting the accident to the engine of the Old Colony, and, classifying this with the others already mentioned, a subject presents itself for the attention and investigation of constructing engineers. That subject embraces the forging of iron, the most suitable iron for heavy forgings, the manner and place of welding, and the reduction of strength by crystallization. The strains that require wrought iron shafts to be 24 inches, and connecting rods 12 inches in diameter, can only be withstood by sound castings and forgings of the best quality of iron, and to secure these practical science and skilled workmanship are indispensable.

The steamer Old Colony, one of the older boats on the New York and Fall River line, was built by John Englis & Son, at Greenpoint, L. I., in 1865. Her length between perpendiculars is 322 feet; beam, 42 feet; depth, 14 feet. The engine of the Old Bay State was constructed at the Allaire Works in 1847, and this engine was taken out and put in the Old Colony. Since that time many parts have been renewed and little is left of the original engine. Fig. 1 is a general view of the engine in working condition. The cylinder is 81 inches in diameter; stroke, 12 feet; has the Stevens cut-off; length of beam (center to center), 22 feet; length of connecting rod, 23 feet; diameter at middle, 11 inches; diameter at ends, 9 inches; diameter of paddle wheel shaft, 18 inches. The crank is of cast iron hooped with wrought iron bands. The condenser is a jet and not a surface one. The boilers are placed on deck by the starboard and port guards. The diameter of the paddle wheels is 38 feet; width of bucket, 2 feet 2 inches.

The center keelson is made of live oak, 14 inches by 30 inches deep, resting on frames 17 inches deep; the frames are of chestnut, hackmatack, and oak.

The accident occurred between Point Judith and Gull

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