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HAVING AN OBJECT AND STICKING TO IT.

Persistence in any chosen vocation is an essential to success. This is a general rule, but we desire now only to apply it to the business of the mechanic. Constant practice, constant study, and constant application are conditions precedent to perfection. But even these will be wasted if the occupation chosen is unfitted to the natural qualifications of the workman. Some are born without any natural aptness for the mechanical arts. Every mechanic understands what is meant by a "mechanical eye." The want in the visual organs thus characterized does not necessarily imply that there is a disease or malformation of the optic nerve, but rather that there is no judgment to direct and guide the eye. The infant grasps as readily at the moon as at his rattle within a few inches of his face. In time, by repeated experiments, he learns the relative distances and dimensions of objects. All are capable of this amount of judgment, but in the practice of mechanics a much higher degree of experience is required and a much closer exercise of the judgment. There are some men who may practice at a mechanical trade their whole life long and never be even passable workmen. They never can tell whether a line is straight, or a surface level, even with the aid of levels and straight-edges. We remember an instance in point, where a young man ardently desirous of becoming a machinist was compelled to forego his favorite business because of this imperfection—the want of a "mechanical eye." His first job was the centering of some pieces of round iron, seven inches long and one and one-eighth inches diameter. He worked with vice, hammer, center punch, and bench centers half a day on twelve pieces, yet he did not correctly center a single one, although he received repeated instructions and examples from the foreman. Indeed he could not, even with the aid of chalk held against the revolving surfaces of the cylinders, see in what respect they were not true. Such an apprentice could never become a workman and his failure would result from no fault capable of remedy. Many employers have had a similar experience with their apprentices, or with those who called themselves workmen. The first requisite, therefore, is to have a proper object, one fitted to the capabilities.

Another of more importance is to stick to it. We take it for granted that every beginner at a mechanical business enters it with the intention and purpose of becoming a first class workman. If not it is more than probable he will never reach even mediocrity. If he is satisfied to serve his time, blundering through his work without understanding it, he will come out one of those nuisances to employers and disgracers to workmen, a "poor tool." Such professional workmen cannot stay long in any situation and are compelled to accept the most distasteful work with the lowest wages. Even under these circumstances there might be hope for them if they would, thus late, endeavor to stick to their business; but, being disheartened, they drift about "from pillar to post," trying this and attempting that, and succeeding in nothing because they will not thoroughly, and honestly, and persistently apply themselves to their business.

Soon apprentices think that when they have achieved the triumph of doing one job in a single department of their business their trade is learned and their position secure. They do not seem to realize that although the customary or legal term of their novitiate has expired they are still learners. New methods of doing work, new tools, new descriptions of work, new combinations of materials are continually being brought forward, and the mechanic who has attained the

position of a first class workman by patient practice, must preserve and hold that position by constant endeavor.

There are others who "stick to it" in a different way. These are they who having spent a limited time in a shop assume to know all they have ever had to do and also all they have seen others do. They have done with learning. In their own estimation they are perfect. When seeking a job they assume a thorough knowledge of the work to be performed and the method of doing it. These men soon find their level. We knew once of such a prodigy who hired into a machine shop and had for his first job the turning of connecting bars tapering from center to ends. He asked a fellow workman how he should turn them. The answer was: "Set the tail of your lathe over," meaning to move transversely the upper portion of the tail-stock to the proper angle. He understood it literally and procuring a crow-bar was swinging the lathe frame out of line with the driving shaft when the foreman discovered him. His services were inconspicuously dispensed with.

Mechanical art does not need such helpers. It needs men with a purpose; men who are willing and ardent to learn; men who are not dismayed at obstacles, but who take a pride in either removing or overcoming them. Only such will ever become mechanics worthy the name. The others are abortions.

CROSSING THE WATER—FERRIES, TUNNELS, AND BRIDGES.

Those who are compelled to use the ferries running from Manhattan to Long Island and to the Jersey shore have been severely tried in temper during a portion of last month. Immense fields of fixed ice, or floating floes driven by keen cutting gales, have interrupted the only mode of transit between the metropolis and Brooklyn, Williamsburgh, Jersey City, Hoboken, and Staten Island, and crowds of anxious and disappointed people in all these places have been put to great inconvenience and expense. It would be a blessing not only to the dwellers in all these localities, but to the transient traveling public and the people of the whole country if some permanent remedy and preventive could be adopted and applied; for whatever delays the ordinary routine of business in this, the commercial heart of the country, must be felt in its effects, to a greater or less degree, throughout the land.

It may not be expected that human ingenuity and foresight can in all cases neutralize the opposition of the elements to the means of transportation; but in this case it would seem that there are several remedies, either one of which, or at least all combined, might bid defiance to wind, water, and frost. The boats used in fair summer weather might be so modified in construction as to be fitted for battling with the ice without impairing their convenience as comfortable vehicles for passengers. Or one, two, or more ice boats, intended for forcing their way through icy obstructions, might be provided to keep the paths of the different ferries open, and be employed in summer as powerful tugs, so that they would, during the fair-weather season, earn enough to at least partially pay for their needed pioneer winter service.

But there is a radical remedy better than either of these. That is to make a permanent crossing between New York and the suburbs on either side by means of tunnels, bridges, or both. There are no obstacles impossible to be surmounted in either of these. Tunnels may be drifted through the strata which form the beds of the rivers, or made of iron in sections, sunk and secured together to make continuous tubes. Tunnels of this latter class may be built of such weight and strength that even the anchors of vessels dragging in a gale would have no more effect on them than on the immovable rocks; but legal precautions could be taken to prevent such accidents.

There does not appear to be any insuperable impediments to the throwing of bridges across from one shore to the other on both sides of the city. The lowness of the shores on the New York margins, both sides, and on the North River Jersey shore, could be compensated for by extending the bridge on open causeways up some distance from the water's edge, landing passengers and teams in the heart of the cities; on the Brooklyn shore the Heights offer an excellent starting point, and from the termini of these bridges might radiate in every direction lines of horse railroads or other means of conveyance to whatever point to be reached. These bridges should be suspended at an elevation sufficient to allow the passage of shipping under them at all states of the tide. Probably a pneumatic tube across the East River will be *un fait accompli* ere long, but valuable as it might, and probably would be for the transmission of freight in parcels, it would be some time before it would become a favorite and popular route for passengers. People prefer to see unavoidable and certain dangers rather than to dread in darkness unknown perils, and the public demand would, we think, be better met by elevated bridges or well-managed ferries than by pneumatic or other tunnels.

But all these methods appear to be feasible. In the advanced stage of engineering science to which we have arrived it is puerile to denounce any such project on account of imaginary or estimated difficulties or the cost of the work. While English and French engineers are seriously considering and estimating upon the project of uniting their two countries by a tunnel of over twenty miles, under one of the stormiest seas on the globe, we ought not to shrink from so comparatively trifling a job as tunneling the narrow strips of inland water which separate us from almost contiguous shores. As to bridges, we have the example of the Menai Straits bridge, the Victoria, the Niagara, and lately the Cincinnati and Covington and the Havre de Grace structures. "What man has done man may do," and where the necessity is so apparent it is not creditable either to our enterprise, public

spirit, or our mechanical progress that the people of the metropolis and of the whole country should be satisfied with such insufficient means of intercommunication as those which now so inadequately accommodate them.

THE ARCADE RAILWAY.

Upon the opposite page we present an illustration of the great Arcade Railway which is now proposed for immediate construction under Broadway, by H. C. Gardner, Esq., and Hon. Melville C. Smith, from designs by S. B. B. Nowlan, C. E.

This is probably the most thoroughly comprehensive and excellent of any of the various plans that have been suggested, for while it provides the most abundant means for rapid passenger transit and relief of the streets, it does not block up any part of the city, but, on the contrary, adds enormously to the available street space. In short this plan contemplates nothing less than the addition to the city of an immense avenue, which is to traverse the heart of the metropolis, increasing its wonderful attractions, augmenting the value of its property, and giving to the people the great boon of sure, rapid and cheap communication.

We think there are few persons who will not be at once favorably impressed with the practical excellence of this plan. The principal objection to be raised will be its apparently enormous expense. But the cost will be comparatively nothing compared with the immense public advantages that would result from its successful construction, and we trust that the enterprising men who have charge of the matter will receive all possible encouragement. It is estimated that the expense will not exceed \$2,000,000 per mile. The cost of the London tunnel railway now in profitable operation is stated to have been \$5,500,000 per mile, the greater portion of which must have been paid for the purchase of the right of way.

Our view is taken from near the corner of Wall street looking up Broadway. The plan, as seen, is not merely to tunnel under the street, but to remove the street itself, block by block, from wall to wall, and construct another street at the depth of fifteen feet, supporting the present street level on arches, and making stores in what are now the basements and sub-basements of buildings. Below all are the sewers, with tunnels for the passage of carts which reremove the offal, etc., that naturally finds its way to the lowest level. This lower portion is to be of the best masonry, strengthening the foundation walls of the buildings and giving ample support to the superstructure. Light—daylight—is afforded the sub-street or arcade by areas inclosed with iron railings between the upper roadway and sidewalk, ample room for which will be found when the upper street will be relieved by the construction of the lower. At convenient intervals flights of steps will lead from these areas to the street below, and the pedestrians as well as those who ride in the cars, will be sheltered from the storms of winter and the suns of summer.

This is a general idea of the plan. Those who have the matter in hand have omitted, apparently, no detail to insure entire success should the plan be adopted. We will mention a few of the most important.

To use the streets from the Battery along Broadway to Ninth avenue, thence to 150th street, thence to a junction with the Hudson River Railroad near Fort Washington. Also a branch beginning on Broadway below City Hall Park and running along Park Row, Chatham street and the Bowery to Third avenue, thence along that avenue to the Harlem River, thence along the river to a point intersecting the Harlem Railroad. The main road and branch to have at least four tracks with room for constructing additional tramways. The streets to be excavated their entire width to a depth of twenty-five feet, the lower ten feet to be occupied by sewers and vaults. Under the buildings exposed by this excavation a range of basement stores to be constructed by the company without cost to the adjoining proprietors and finished in the same or a corresponding style with those above. Walks to be laid as now on the streets above. The railroad to be covered by a roof supported on iron colonnades between walk and track and between the two roadways, covered with heavy plank filled in with concrete, supporting a water-tight iron pavement, constituting the upper roadway. Ample precautions for the support of the buildings and arrangements for conveying the sewage, gas, and water, to be provided by the company.

The method of construction proposed is that the street to be excavated will be taken up one half side of a block or square at a time, so as not to interrupt travel more than in the erection of any new building, the supply of gas, water, and the convenience of sewerage to be kept up during the progress of the work. The cars on the outside tracks in this lower street are to be run at the rate of about five miles per hour, and intended for way passengers. Those on the inside tracks to run at fifteen miles an hour, to stop only at stated points, all to be drawn by locomotives emitting neither smoke nor sparks.

The necessity of some thorough and permanent relief to our over crowded streets is too apparent to require argument. The advantages of this plan are readily seen from the foregoing remarks. Freight and passengers will be largely diverted from the present routes, both being sheltered from the elements, whether storm or shine. The upper roadway will be kept in more passable condition in respect to snow and ice by the latent heat from the immense mass of iron used in the building of the arcade. Property owners on the streets will be gainers by an addition to their rentable property, and the sub-roadway will become a favorite means of transit in stormy weather and as a shelter from torrid suns.

Better facilities than now exist will be afforded for the repair of our gas, water, and sewerage pipes, and it will be an attraction to out of town visitors second only to that of the great Central Park.