The Value of Physics to a Mechanic.

If the ordinary, every-day workman, engaged at his bench in the pursuit of his vocation, were aware of the enormous number of natural laws by which his every action is controlled, he would be surprised at their existence and desirous of learning about them. This desire would be natural and most praiseworthy, yet the fear of study seems to prevent those who would like to gain this knowledge from simply reading, as one would a story, the interesting things described in books on physics—facts far more valuable than fiction, and so clearly demonstrated that a mere tyro can understand and experiment from description, thus proving how much can be learned even from a rapid perusal.

Why should a woodworking mechanic study the science? The reasons why he should do so are numerous and important, and in explaining some of them we shall endeavor, as far as possible, to show its practical application and the part it plays in his individual efforts, though, at the same time, it must not be forgotten that all the movements on this earth of ours depend on and are controlled according to the principles of natural philosophy.

Let us consider for a moment its bearing on a man standing at a bench in the act of pushing forward a jack plane. What first of all retains his body on the floor on which he stands? The force of gravitation, which, as described, *retains* the earth particles together, and all bodies animate or inanimate on its surface, by drawing them to its center, this influence being exercised on the building in which he labors, retaining its constituents in their positions. It also acts on his person to such an extent that were he devoid of the power of movement, he would be as immovably fixed as the inanimate wood he stands upon. This force, likewise, keeps his stuff on his bench and the plane on his work, and prevents the flying off at a tangent which would occur with all terrestrial bodies were the attraction to cease for a moment. How simple is the fact when demonstrated!

Avoiding the consideration of the different attractions, we will glance at the mechanical means he goes through in planing. Standing with his two feet together, would it be possible for him to lift a shaving? It would not, because the resisting force generated by the friction of the wedge-shaped iron in entering the woody fibers would be so great that his body, being unable to resist it, would be pushed outside the perpendicular line of gravity, and fall. To overcome this resistance he increases his base, and lowering the center of gravity of the body, leans forward and throws his weight on his left leg, with his right forming, as it were, a brace.

Now he can exert his powers effectually, for having overcome unvarying natural forces by the use of natural laws.

His arms, as he moves them forward or draws them back again, are nothing more than a splendid system of compound levers, and the tool employed is on a cubical prism, with an angular opening into which a wedge of steel is inserted and fastened, with its point projecting below the sole or lower face. This wedge is forced forward by lateral pressure, and entering the wood gives out a shaving or strip equal in proportion to the projection.

How many of us are there who know that the edges of our plane iron and chisels, saw teeth, in fine our principal tools, are modifications of a simple wedge, and fewer still who know its power or how to increase its utility in practice.

To us who handle it daily, the screw, or as it is in reality a revolving wedge, is a mystery and an unknown thing, though we are familiar with its usefulness; yet, while in the act of propelling a screw with a screw-driver, a multitude of forces and machines are employed, which are grand in their simplicity and worthy of study

That which teaches why a plumb bob hangs quiescent at the extremity of a string, and why a level is determined by the centering of an alcoholic bubble in a tube, and other valuable mechanical facts, should not be passed over by him whose philosophy is to devote his life to improving the means by which the comfort and happiness of human nature are gained. Independent even of this essential reason, it is imperative that we make ourselves acquainted with the component parts and properties of materials, in order to train the mind into a line of thought tending to invention and the bringing forth of valuable ideas, which only those familiar with this science can essay.—*Builder and Wood-Worker.*

RAISING LIQUIDS BY COMPRESSED AIR.

In many industries it is necessary to raise liquids stored in casks in the cellar to an upper story of the building. We have recently visited an establishment where this operation is effected by means of compressed air. The compressing of the air is performed without any expense, in this case, by means of city water led into a special reservoir. This system, which was devised by Messrs. Sainte & March, engineers for Mr. Lebeault, proprietor of the Bugeaud medicinal wines, has appeared to us to be of sufficient interest to be made known, as it is capable of being applied to any other liquor of value.

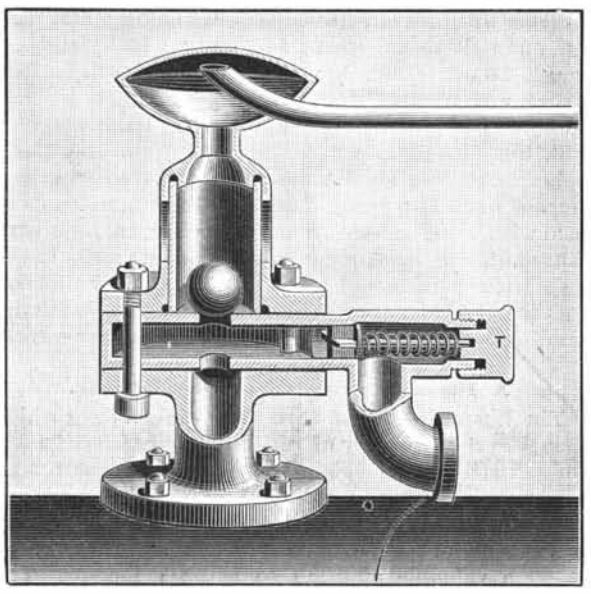

Fig. 2.—BALL VALVE.

In the establishment under consideration, the liquid to be raised is very costly, and, as it would undergo alteration in contact with metals such as iron or copper, all the vessels that are to contain it are lined with tin, and all the pipes and cocks are of the same metal.

As already stated, the agent by means of which air under pressure is obtained is city water, which is made to pass into a reservoir before being used for washing bottles, so that the consumption of water is not increased by this mode of work. Besides, the use of pumps is avoided, the maneuver of which is troublesome and requires time, and which so stirs up the wine as to affect its quality.

In Fig. 1 we give a general view of the arrangement. In the cellar are the tuns, one series, G, of which contains Malaga wine just as emptied from the casks. Each of these tuns is provided beneath with a three-way cock, which puts it in communication with a general conduit

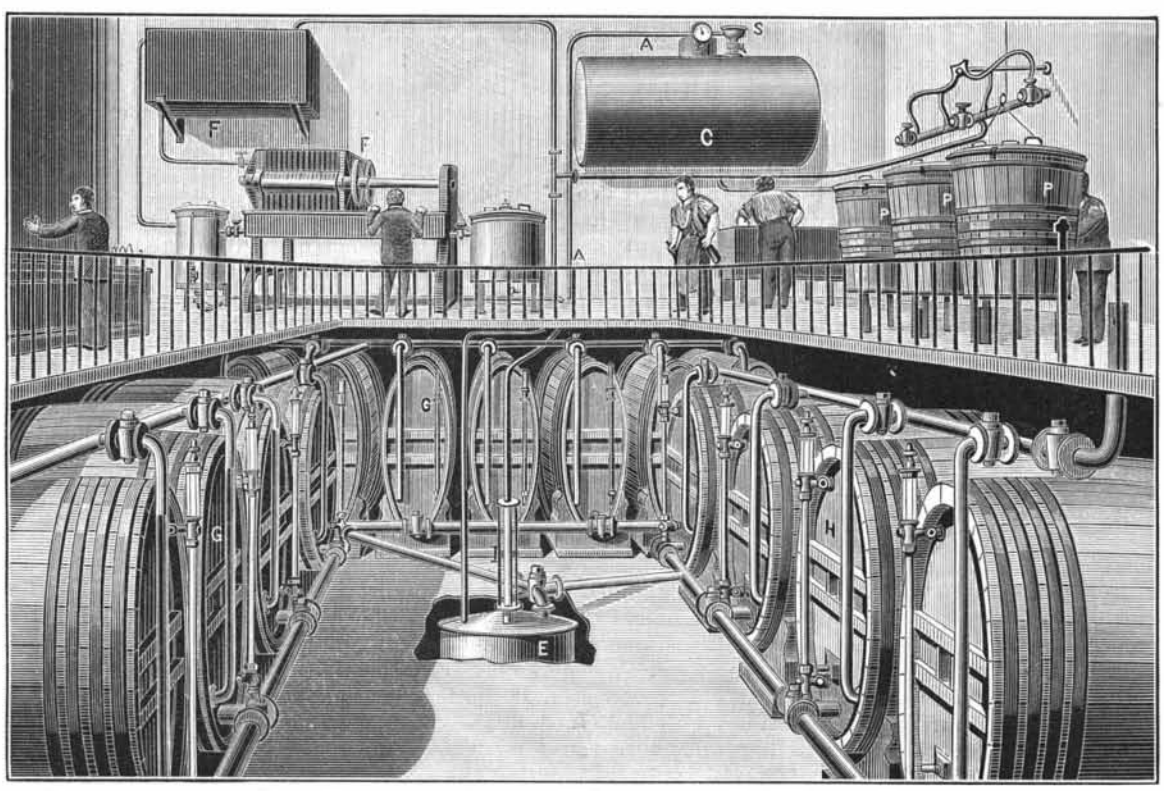

Fig. 1.—RAISING LIQUIDS BY COMPRESSED AIR.

ending in an elevator reservoir, E. Into this latter is led the quantity of wine that it is desired to raise to the mixing apparatus, P. A float, the extremity of whose rod is visible through a glass tube, I, shows the level of the wine in the elevator.

The compressing is effected in a reservoir, C, which communicates through the upper part with the elevator through the intermedium of a conduit, A A I. The water enters at the bottom and expels the air, the pressure of which, shown by a gauge, gradually exerts itself upon the wine in the elevator and causes it to rise to the mixing apparatus. From these latter, the liquid, converted into Bugeaud wine, descends to the tuns, H, of the second series, where it remains for some time. Before delivering it for consumption, it is necessary to make it pass into a filtering apparatus, F, situated on the ground floor. Hither the proper quantity is sent by the same process as before. From this apparatus the wine passes to the bottling machine.

In order to prevent a portion of the water coming from the compressor from entering the air pipe, a float cock is so arranged as to shut off the water when the compressor is full. But, as float cocks are apparatus that cannot be thoroughly depended upon, Messrs. Sainte & March have interposed a safety device, S, at the branching of the air pipe. This device is shown in Fig. 2. It is a ball valve in which the ball is lighter than the water. As soon as the latter enters, the ball is carried along the surface and closes the upper orifice of the valve. The little water that might pass is held back in the small reservoir, R. A spring clack, whose spring has a tension regulated by the nut, T, allows of the escape of the water, as if through a waste pipe, as soon as it exceeds the limit beyond which it ought not to go.—*La Nature.*

To Crystallize Tin Plate.

Crystallized tin plate has a variegated primrose appearance, produced upon the surface of tin plate by applying to it in a heated state some dilute nitro-muriatic acid for a few seconds, then washing it with water, drying, and coating it with lacquer. The figures are more or less diversified, according to the degree of heat and relative dilution of the acid. Place the tin plate, slightly heated, over a tub of water, and rub its surface with a sponge dipped in a liquor composed of 4 parts of aquafortis and two of distilled water, holding 1 part of common salt or salammoniac in solution. When the crystalline spangles seem to be thoroughly brought out, the plate must be immersed in water, washed either with a feather or a little cotton, taking care not to rub off the film of tin that forms the feathering, forthwith dried with a low heat, and coated with a lacquer varnish, otherwise it loses its luster in the air. If the whole surface is not plunged at once in cold water, but is partially cooled by sprinkling water on it, the crystallization will be finely variegated with large and small figures. Similar results will be obtained by blowing cold air through a pipe on the tinned surface while it is just passing from the fused to the solid state.—*Spons' Workshop Receipts.*

Mahogany for House Finishing.

The *Northwestern Lumberman*, which is good authority on the commodity of wood, informs its readers that people whose tastes favor mahogany for inside finish can now indulge them without paying much more money than they would for a finish of the higher priced native hard woods. To do this, however, the mahogany must be bought as lumber. If a man unacquainted with the price of mahogany bargains with a contractor to finish one or a dozen rooms, as the case may be, in what has sometimes been called the "king of woods," he may depend on it that the price will be a round one. Furniture manufacturers take the same advantages of their customers. They seem to think that because mahogany is not a common wood, because it is very fashionable, and in former days was expensive, consumers will take it for granted that they must pay a good deal of money for mahogany furniture. It is enough to make the initiated smile to walk through a furniture house and price articles made of the different woods. There may be a table or chair of cherry and mahogany standing side by side. The same amount of work has been expended on each, but for the mahogany article at least two prices are asked, when the fact is the wood in it did not cost 25 per cent more than did that in the cherry piece. But simply because it is mahogany a fancy price is wanted. Furniture users will undoubtedly for all time be obliged to pay these exorbitant prices, but there is often no reason why the man who wishes to finish his house in mahogany should not buy the lumber and have his carpenter work it as he would cherry, walnut, or oak.