

entirely into the hands of one competent person, and judges selected properly qualified for their duties.

In the main building the principal things worthy of notice were those articles manufactured in Canada, and for the excellence of which, when competing with other countries, it was desirable that we should obtain the highest mark. Certainly the exhibit of textile fabrics was undoubtedly excellent; also the manufacture of rubbers—in which the Canadian Rubber Co, and the North American Rubber Co., of Quebec, exhibited goods equal in style and finish, to any made in the United States. The Canadian Rubber Co. also had a very fine display of belts and other goods in their line. Messrs. Watson, & McArthur, had a very fine exhibit of wall paper; we were by no means prepared to see so fine a show, as it was not expected that this firm, which only commenced to print a few weeks ago, could have produced, at the very outset, such excellent paper and workmanship; taking the first prizes in excellence of manufacture and decorative paper. Among the manufactures of hardware, foremost, conspicuous, and most attractive as being connected with one of the greatest industries of the country, and the source of her greatest wealth,—was the exhibit of saws manufactured by James Robertson, of Montreal. This exhibit consisted of saws used principally for sawing lumber, from a circular saw of 6 feet diameter to the smallest used. The tasteful arrangement of these bright radiant blades, studded over a ground of black cloth, and under an awning of the Union Jack, was much admired, and was decidedly the most attractive feature in the Exhibition. As usual, Mr. Robertson not only took first and extra prizes, but a diploma as well.

We regretted to see so meagre a display in the machinery hall. There was nothing very remarkable to be seen there. The great centre of attraction appeared to be a machine for manufacturing horse-shoe nails.

There were, however, three things exhibited in this hall which had modestly taken their position in a corner, that deserved particular notice, and to which we desire to call the attention of all sanitarians, architects, builders and plumbers; and these were an improved water-closet, tank, and water-tap. These three articles are the invention of Mr. John Robertson, manager of the Montreal Rolling Mills. As we have always advocated so strongly in the columns of this Magazine sanitary reform, we hailed with much satisfaction this great improvement in water-closets, and would strongly recommend their adoption. Two particular features in this closet were much approved of; one was, that the trap was thoroughly emptied of its contents at each flushing, and simultaneously sealed with water into which no impure matter could enter. The other was, that it is worked without the aid of wires, a matter of much importance as wires are constantly breaking and getting out of order.

The arrangement on the grounds for the accommodation of the horses and cattle was deserving of all praise. The exhibit of these animals was very creditable; also the exhibit of poultry was very good, and the plan adopted for the public to see the birds, causing the people to go one way, is the plan that should have been adopted for the main building.

It is to be hoped that, at the next Exhibition, and all future Exhibitions, steps will be taken to prevent overcrowding of the buildings, and to put down the rudeness of the roughs. Had an example been summarily made of those Goths, who thought nothing of crushing

feeble women and children, it would have had a very salutary effect.

THE ADHESION OF BELTS.

J. H. Cooper, a well-known writer, has the following in the *Boston Journal of Commerce*:

"The driving power of belts—by which we mean the holding on to, the adhesion, or that which imparts motion to a belt while in contact with a revolving pulley—has been attributed to several causes, to one of which I wish to refer—that of atmospheric pressure. It is called to mind now by reading some articles in late issues of your paper, which lay great stress upon the efficacy of this means of creating adhesion. This announcement is much like that startling physiological statement of the many tons of pressure imposed upon the human body by the atmosphere, which is very taking to the sense until better known.

"A belt has a movement to and from a pulley with perfect freedom, regardless of the atmosphere, touching it as its form, pliability and strain permit, and holding to it according to the interposed unguent, adhesive, or what not, which has been spread over the surface of the belt and pulley. The kind of adhesive used has much to do with the driving power of belts. Suppose fine lubricating oil be employed on clean surfaces of belt and pulley; this will effectually exclude the air from the surface of contact, but the driving power will be reduced to a minimum, if there be any at all transmitted. If dry dust of yielding material be employed on clean surfaces of belt and pulley, then indeed will the air, with the dust, diminish driving power. There are conditions of belt driving where it is alleged the interposed film of air lessens adhesion. Upon this, Rankin says: 'It is well known, through practical experience, that a belt for communicating motion between two pulleys, requires a greater tension to prevent it from slipping when it runs at a high than at a low speed. Various suppositions have been made to account for this, such as that of the adhesion to the belt of a layer of air, which, at a very high speed, has not time to escape from between the belt and the pulley. But the real cause is simply the centrifugal force of the belt, which acts against its tension, and therefore slackens its grip on the pulleys.'

"In collecting 'belting facts and figures,' during the last score of years, for my own use, I met with several statements asserting with considerable confidence the doctrine of 'suction,' as the chief cause of attachment between pulley and belt; but I could not find anywhere written a fair statement of reasons why such force did not act according to the circumstances of belt driving, nor could I discover any appeal to experiment, which, by removing the atmosphere, in this case putting suction outside the apparatus, and thus settling once for all the value of vacuum for belt driving.

"It is very true, that if the belt does not touch the pulley, it cannot pull it around, nor can it be driven by the pulley. It is also true, that if the belt and pulley touch on a limited area only, each can drive the other with a force but a part of what it is capable of doing, and it is only when contact is made perfect—that is, when every square inch of the belt, so to speak, is down solid on the pulley surface, which surface we will grant is very smooth—that the greatest driving effect is obtained. These things being so, are we yet warranted in concluding that the imparting of motion from belt to pulley, and pulley to belt, is all the work of the air, or rather the effect of its absence from the region of contact, and the presence of it on opposite sides of belt and pulley?

"Again, is the driving of the belt in the same direction as that in which the suction is felt? Now, mark, the atmospheric resistance becomes sensible by pulling at 'right angles to a plane surface of joint which does not admit air.' Release the pull, and try to slip the sucker over the surface to which it is applied; it moves freely in every direction, offering no resistance, possessing no adhesion, being in fact in equilibrium, and, by lifting one edge, can be raised wholly away with ease. The power of the belt does not move in lines at right angles to its contact with the pulley face, but tangent to the pulley circle—parallel to the face of contact. As we slip the sucker freely on the flat wetted surface, so the belt slides on the pulley face; there is no atmospheric pressure manifest in either case.

"But has any one tested this matter in a vacuum, and made record of the results gained? I have; and, if, you allow me, will quote, from 'Use of Belting,' what I said about this several years ago: 'The adhesion of belts to pulleys is frequently attributed to the pressure of the atmosphere; and, in order to show how much the air influences belts in this parti-