

Luckily, I believe that almost all factories that have been started in Australia have proved payable, and I hope and feel that, with due care, this will continue to be the case; but a word of warning in respect to starting without reasonable assurance of success may not be out of place.

Another matter of great interest is that of the motor vehicles, which has come so prominently before us of recent date. The motor car is so well known that there is no need for comment, but the advent of the commercial motor vehicle seems to be likely to revolutionise our present notion of street traffic. During last session we had a most interesting paper on this subject, and lately I have noticed our morning papers dealing considerably with the advantages to be gained by the use of these vehicles.

So far, Sydney has been rather behind-hand in this respect, but there are signs of people taking it up, and there is every reason to believe that in the near future we shall see delivery vans of all sorts on the city streets, and, according to figures, it would seem that the cost of handling goods in this way will be reduced, in addition to which the extra expedition gained will be of considerable benefit to everybody. I have heard it said that the steep hills of Sydney are detrimental to this form of handling heavy goods, but, having seen one or two recently on our steepest grades, I am quite satisfied that nothing but good could be gained by the general public from the introduction of the faster method of haulage. Possibly some new method of road-making may have to be considered in the suburbs, due to the different character of the wearing, but if this should be necessary then, even at considerable expense, it will have to be done. Progress cannot be stopped, and if the commercial motor vehicle is the cheapest and most

rapid form of delivery known, then every facility must be given to it.

Another great advance made during the past year has been in aerial navigation. This is a matter which, up to within quite recent years, almost everybody, with the exception of Mr. Jules Verne, considered outside practical engineering. True, improvement in this class of work was for some years very slow, but since Mr. Hiram Maxim, in the year 1894, proved that he could make a machine heavier than air rise off the ground, experimentalists have been at work, and tens of thousands of pounds have been spent on this, perhaps, greatest of all inventions, and so far, during the last two years, improvements have been such that the engineer would be rash who would say that in ten years from now we shall not be taking aeroplane trips instead of motor car rides. I daresay there are some of our older members who will not agree with this proposition, but I believe that when the first trains ran it was a considerable time before a great many of our ancestors would give up the stage coach. Personally, at the moment, I should prefer to see others in the aeroplane, but I daresay it would not need much inducement, after seeing two or three lots of travellers taken to their destination safely, to make me change my mind.

Another of the very great inventions which has come more into prominence recently is that of wireless telegraphy. It is perhaps more of an electrical subject than of a mechanical engineering subject, but we are very near akin and it will stand mention here. When we remember that it is now possible from hundreds of miles away to send a telegram to one's friends ashore and receive their reply, or to communicate from one ship to another with as much ease as if you were ashore, it really makes one feel that it is impossible to get a holiday anywhere. Before this invention, a business man

could go away, and, after leaving Fremantle, be sure of not being worried by his business until his arrival at Colombo; but so soon as our Federal Government make up their minds to establish wireless telegraphy stations, that unfortunate man may find on his breakfast table a telegram asking him what his office is to quote for a certain article, or telling him that his business premises have been destroyed by fire or earthquake, and asking him to return by the next boat from Colombo.

Presumably, it is impossible to stop the wheels of progress, but one sometimes wonders whether those who lived 100 and more years ago did not have a better time: they did not rush about chasing the nimble shilling all the time, and if they wanted a holiday I imagine they only had to get some 50 miles away from their office to be quite safe from interruptions. Possibly in those days there were compensating disabilities, and while we sometimes envy them we may, on the whole, be happier.

However, whether certain individuals are going to be worried by this wireless telegraphy or not, one thing is certain, that the Federal Government should lose no time in establishing wireless telegraphy stations throughout the Commonwealth.

The importance of being able to communicate at the greatest distance possible with ships that are on the sea is so great, on account of the possible saving of life and property, that the ratepayers would liberally subscribe to the Federal Government at any reasonable expense for establishing these stations; and it is to be hoped, while it may be admitted that extreme caution should be shown in selecting the various sites and collecting the necessary information to ensure a reliable and up-to-date service, no time should be lost in installing the necessary apparatus, thereby keeping the communications from shore to ships passing up-to-date.

A matter that has been mentioned in our daily press will shortly be brought before the Council of this Association, namely, the question of stimulating the inventive genius which is in our midst. We have been reminded that our Agricultural Show, while having a large engineering section which is a constant attraction to the public, has not so far taken any steps towards the encouragement of inventors, and I think this is a matter which the Engineering Association might take into their consideration, and, although admittedly a question that deserves and requires very great consideration, there does not appear to be any insurmountable obstacle in the way of arranging such stimulation.

If we were to approach the Agricultural Association asking that in the engineering section there should be a building specially set apart for an exhibit of inventions during the year, and if by some combination between us we could arrange for a substantial prize for the best invention of the year, the probabilities are that there would be a considerable number of competitors for the prize; it may be said this is an ambitious view to take of the matter, but admittedly those among us who have an inventive turn of mind are handicapped through being so far away from the centres of the world, and some stimulating encouragement may be necessary to warrant these in making the necessary experiments to prove their inventions, and why should not we, in conjunction with the Agricultural Association, be responsible for such stimulation? It would probably be necessary to confine the inventions to those having a mechanical status, and then to appoint a Committee jointly with the Agricultural Association to consider the various inventions sent in for competition, and select those considered to have sufficient merit to warrant their being exhibited and judged.

Then there would be a Judging Committee to select what they considered the best invention of the year.

Most of us know that there are a number of engineers who are always inventing, and it will be necessary to curb this prolific series of inventions; otherwise the Agricultural Grounds would be all too small to hold the exhibits offered. But if some such scheme as that proposed above should be adopted, I think the matter could be kept within bounds, and that the resultant exhibition would be an education to the public, and, further, show the engineering fraternity the trend of thought that was going on among the young members of our profession.

Then again, our attention might be called to some young aspirant for fame, who, while his invention might not be finished and complete, it might be sufficiently original and clever to warrant us keeping our eye on that gentleman in the future.

I do not know what the views of the Association will be in this matter, but I put it forward as a possible way for the Engineering Association to encourage the latent ability which possibly only requires some stimulus, and, even if there is only one good invention in three or four years, we shall be well repaid for the trouble.

I am glad to say that, from recent investigation, our factories have shown a tendency to take advantage of the latest labour-saving devices available. Quite recently there has been a great improvement in this respect. Conveyors for all kinds of goods are to be found in most of our warehouses, some of the cleverest and most labour-saving being in our large wool stores, and to see the manner in which the wool bales are conveyed from one end to another of our long stores, after comparing it with the method of only a year or so ago, makes one wonder where this improvement is to end.

It matters not now in what class of factory you go,

you will find the conveyors doing the work of many men—doing it more expeditiously and more cheaply—and there is no doubt that it is only by these economical methods of working that we can hope to make up for the price of labour that it is necessary to pay in Australia compared with other countries in the world.

In most factories of all sorts now, the electric drive is practically ubiquitous, but even up to now the full benefit of this now somewhat ancient agent is not being fully taken advantage of—especially in so far as portable tools are concerned. To be able to take the tool to the work, in place of the work to the tool, is, I think, an admitted advantage, and there are only two cases in which this can be done satisfactorily, either by pneumatic tools or by electrically-driven tools; and there is no doubt that the electrically-driven tools in most cases lend themselves to the work better than the pneumatic; it is easier to convey wires to a point than pipes. Unfortunately, owing to one or two failures of electric drills, a set-back was given to the electric portable tool; but these failures, I venture to say, were more imaginary than real, being due to the wrong combination being supplied for the particular work required, and, as we all know, man is a thing of prejudice and, because this particular article did not give satisfaction from the first, the conclusion is jumped at that it would never give satisfaction. There is always a tendency of this sort—instead of trying again, it takes a considerable number of months, and sometimes years, to convince the men concerned that if they were to make another attempt with a properly designed tool, for the particular work, everything would be alright. No, they prefer to go to something else which they know, and so that shop remains in that status quo, in spite of what their neighbours may do, for a considerable period, and that shop sits down and sees its competitors, who did

not have their first bad pioneer experience, go ahead with the more up-to-date equipment and get good satisfaction. Admittedly, pioneering is an expensive and risky job; but if nobody is going to take the risk—if there are to be no pioneers, in other words—then the days of progress are numbered.

One often hears it said, when inviting a pioneer to go in for a new article, "Oh, wait till I see what So-and-So does," and it always seems to me rather humorous, because if everybody was like this man, that article would never get tried. If we are all going to wait for "So-and-So," we shall find it difficult to find him before long.

Personally, I believe that any workshop manager or Board of Directors should be prepared, providing they can be shown a saving without too big a risk, to go in for the latest labour-saving device, at the earliest possible moment, feeling that while they may fail now and again to get that satisfaction promised them, the percentage of times when they succeed will amply repay them for the rest of the times that they fail; and I hope to see New South Wales' factories continuing in their upward path, installing the latest labour-saving devices and taking whatever small risk there may be in doing so, feeling sure that that is the only way by which our factories can keep going and compete with the outside world.

In these days of high-speed tools it is of the utmost importance that the tools should be run at the correct speed for the particular work, and recently great advance has been made by electric motor manufacturers towards placing in the hands of workshop managers a motor of a variable speed design, admirably fitted for this particular work. It is, of course, essential that motors of this sort should be able to run at any speed and load, without it being necessary to move the brushes,

and, in order to attain this, makers have adopted a combination of commutating poles and compensating winding. The result has been that motors can be arranged to give very large speed variation simply with a plain shunt regulation, which regulation is the simplest and most satisfactory known at present.

In laying out a factory with electric drive, perhaps the most difficult problem, and one on which it appears impossible for experts to arrive at a unanimous opinion, is to what extent individual motors are advisable, or, on the other hand, to decide when it is advisable to go in for groups of machines driven from one motor. There is no doubt that this difficult question can only be decided on individual jobs, no general law being laid down on the matter; probably the main point to be considered is the length of shaft and number of bearings necessary for the grouping method. If a number of small machines can be grouped on a comparatively short shaft, then probably the one motor will work out the best in the long run, being cheaper in first cost, and, providing it is kept running at reasonable load, more efficient in up-keep.

There is one matter that I should like to mention in connection with this motor-driving, having, during the course of the last year, come across several instances which have given me trouble and have had to be overcome, and that is the driving by motor of such machines as air compressors. I have found that the use of a fairly heavy fly-wheel has repaid me amply in many cases—the energy stored up in the fly-wheel keeping a more even running and thereby preventing a nasty spark on the commutator at every stroke of the compressor. Admittedly this fly-wheel method makes it more difficult to start the machine, but the advantages to be gained afterwards are such as to amply repay one, and where it is found that motors doing this class of work are giving



trouble it would be well to try this method of curing it.

I should like to say that these remarks must not be read to mean antipathy to our workmen; when I say "labour-saving devices" I do not mean that I wish to see fewer men employed in our factories, but my impression is that, the more labour-saving machinery is installed in a factory, the better for the working community, the larger the factories will become, owing to the cheapness of manufacture, the more men will be required to attend to the machines, and therefore the workman will not lose anything thereby, whereas the community will gain.

While fully alive to the importance of this labour-saving machinery, I do see one dangerous aspect of the adoption, and that is whether it is going to have any effect on the qualities of our artisan. When everything had to be made by hand, our fitter had to be a man of exceptional ability, and able to work to a very fine standard. Now, the machines do most of the things for him, and he can stand by and look on, and the danger is that we shall develop a class of fitter who is really nothing more or less than a machine tool man; this would not be for the good of engineering in any shape or form, but I do not fear this much, as the fact of these machine tools being able to turn out such accurate work proves that they must of themselves have been extremely accurately built, and whereas the actual man watching the running of the machine may not of necessity be such a high-class mechanic as in the past, he must still be a very competent mechanic, otherwise, should anything go wrong, he would be incapable of doing the necessary repairs; and, so long as our factory managers and owners engage men who can not only work the machines, but can also repair them, there is no fear of the deterioration of our work.

It would be impossible to close this address without

touching on the wonderful progress made in connection with internal combustion engines, especially the suction gas system of power generation.

The advances made during the past year are such as to make all engineers who come in contact with generation of electricity, for instance, seriously consider whether the suction gas system is not now a rival of the steam engine—at any rate, in many cases. At one time a gas engine of any considerable size was looked upon as a questionable success, owing to the irregularity of running. The other day I had an opportunity of seeing a really up-to-date suction gas plant at work, the plant developing some 350 h.p., and the absolute regularity of speed, in spite of a shifting load, astonished me. When carrying full load, the engine running at about 160 revolutions per minute, the circuit breaker opened, throwing the whole of the load off the engine instantaneously, but the governing was such that the engine practically remained at constant speed.

Now that the gas engines can be made to govern in this way, quite equal to the governing on any high-speed steam engine, the complaint that used to be made against them no longer exists, and, with this suction gas process, there can be no question, I think, of the economy in the consumption of fuel and water.

As to whether some further improvements are not likely to be made in the near future more in the gas generating end probably than the engine, is a question I cannot go into here; but, from what has been done recently in Australia with plants that have come under my notice, I think it is pretty safe to say that suction gas engine plants are on the market to stay, in spite of some small difficulties which, apparently, still occur in connection with clinkering in the gas generating plant, etc.