

THE WORLD'S FAIR.

GREAT MACHINERY IN OPERATION.

Tests of the Immense Locomotives. Some of the Appliances for Preventing Accidents—The Wonderful High-speed Monorail Electric Railway.

BY EDMUND MITCHELL. [SPECIAL CORRESPONDENCE OF THE TIMES.]

ST. LOUIS, July 25.—Machinery is a big fact at the World's Fair, and the part it plays is of more importance than most people, without giving the matter any special thought, imagine. These great engines in the Palace of Machinery are revolving all day long not merely to show us their power and their mechanism; they are pumping the water which leaps down in the cascades from Festival Hall. Similarly those ever-industrious dynamos are storing the electricity which lights up the scene at night with myriads of lamps. Across the way, in the Palace of Transportation, a railway engine has her driving wheels spinning hour after hour; this is no cheap attraction

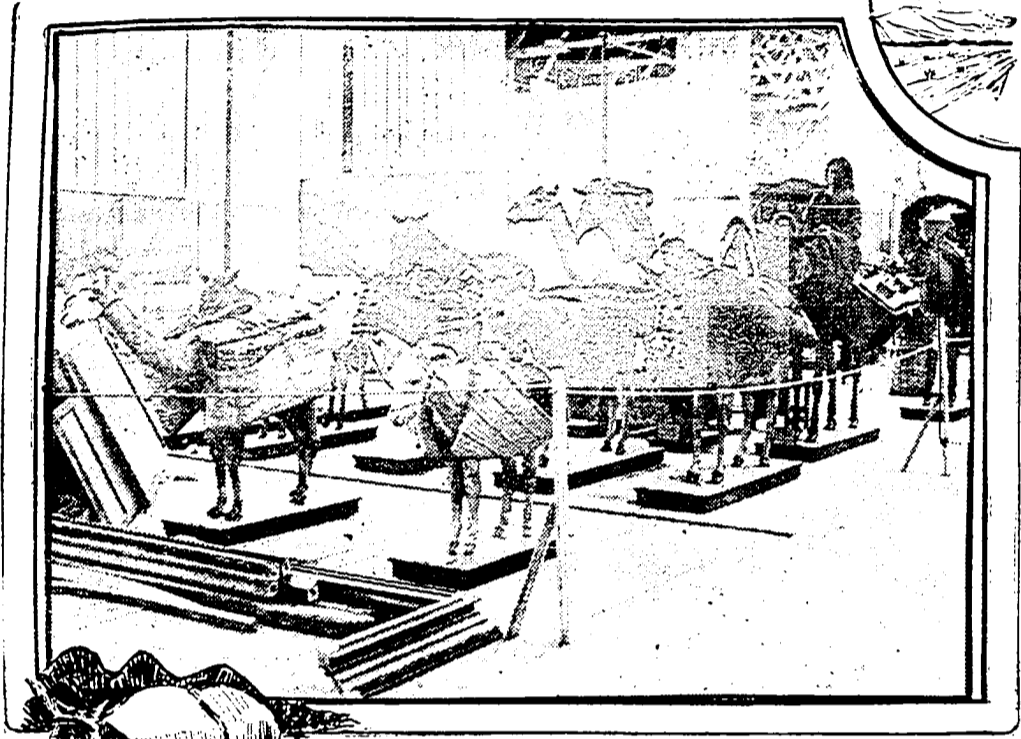
The Transportation Building is one in which every visitor to the fair loves to linger. The evolution of transportation as shown, first of all, by every beast of burden brought into subjection by mankind, is very fascinating. We see the burro of the Rockies, the llama of the Andes, the yak of the Himalayas, the bullock of the Philippine Islands, the camel of Mongolia, and a score of other carriers besides, in their working equipment. In like manner we can follow the story of wheeled transport from its first rude beginnings, even the old-time American method of getting tobacco to the coast by fixing shafts to the huge barrel itself being illustrated. The lesson is carried on down the centuries, for in another section we have a

joining building, that of Varied Industries. Here, in the British section, we have a cotton-spinning plant in operation, from Oldham, Lancashire, the center of the industry. The machinery, of course, is noteworthy from the point of view of mechanism, but to the general observer its most interesting feature is the care displayed to minimize the risk of accident to the workers. In the first place, the shafting is all enclosed in steel pipes. Secondly, the cogged wheels are fitted with covers, which cannot be lifted during the running of the machine; nor can the machines be started until they are closed down and locked automatically. Thirdly, the gearing below is enclosed in a box, which must be closed before the machine will consent to start, and cannot be opened so long as it is running.

be whisked from Liverpool to Manchester in less than twenty minutes, and as there can be practically no oscillation will hardly realize that he has made the trip of over thirty-four miles.

Here is a clear case of legislation aiding to protect life. The new and stringent law in England, providing compensation to workmen injured and provision for the families of those killed, permits of no evasion on the question of the workman's culpability. The injury is the essential fact at law, and the compensation is fixed on the basis of so many weeks' wages. Furthermore, there is no delay permitted in payment by appealing from court to court. Therefore, employers in self-defense have had to insure themselves against this class of damages. But the insurance companies insist on due precaution to prevent accidents, proportioning their premiums accordingly. Hence the great care and ingenuity now manifested to provide safeguarding appliances as exemplified by this particular cotton-spinning plant.

In the Liberal Arts Building, where



Evolution of Transportation Exhibit.



for the passerby, but a scientific experiment which the engineering world all over America and beyond is following with the closest attention. Nor is machinery in operation limited to these two buildings; in the Palaces of Varied Industries, Manufactures, Liberal Arts, Mining, Education, Electricity, and Agriculture, also in the United States Government Building, there are plants which must be visited if we are to get a comprehensive grasp of the machinery display as a whole.

series of representative locomotive engines from the beginning of steam traction, all of them working reproductions from the original drawings. These culminate in the latest and most powerful engine built for our Eastern roads, shown at actual work. Again, the development of the tramway car is fully demonstrated, and we can only fully appreciate the change which twenty or thirty years have wrought when we contrast the primitive forms of vehicle for horse, for cable and for electric traction with the up-to-date trolley car, represented by one of those running between Los Angeles and the outlying towns clustered around the metropolis of Southern California.

AUTOMOBILES.

So along all the branches of constructive skill. Everyone wishing to study automobiles will find a magnificent display from all the leading manufacturing nations, France, Germany, Great Britain, and, of course, America. Among them are types of racers, built, not for comfort, but to minimize the resistance of the air. The finest train of railway coaches ever put together is shown by the Pullman company. It marks a very distinct change from the over-elaborate ornamentation in favor of a few years ago to the simplicity that is so much more pleasing and artistic. The Illinois Central Railroad introduces us to a passenger car, opening by side doors and designed for heavy suburban traffic, that is a marvelous piece of ingenious mechanism. The interior of the car is open through its entire length, and the seats are placed transversely in the center, with aisles on either side. In line with each bench of seats are sliding doors, which at starting are closed simultaneously by the turn of a wheel operated by the trainman. The engine is connected electrically with every car, and until the last door of the train is closed and automatically locked, a danger bell on the engine continues to ring, forbidding any start to be made. On arrival at a station a trainman, by pressing a lever, unlocks all doors, which the individual passengers wishing to descend slide open for themselves; or, if the terminus is reached or a crowd is waiting to enter, all doors are at once thrown open by the action of the controlling wheel. The great advantage is that the formation of jostling groups at the ends of cars is avoided, as the passengers await the train evenly distributed along the entire length of the platform. There is also the all-important point of safety.

there is a great display of delicate machinery, such as printing presses, typewriters, adding machines, dental apparatus, mechanical piano players, etc., an extremely simple but clever engineering device in connection with irrigation works should not be overlooked. It is shown in the Egyptian Court, and is a detail in the construction of the Assuan dam, which is most fully illustrated by models, plans and photographs. The dam, one and one-fourth miles across, is pierced by 180 openings, furnished with regulating gates. Many of these latter are at a great depth, and have therefore to withstand the pressure of millions of tons of water. Steel gives the required strength of material, but the next problem was how to move them up and down. The window sash system of ordinary sluice gates was impossible, for the enormous pressure would have jammed the surfaces in contact so as to make the gates immovable. To reduce the friction, cast-iron rollers were introduced between the face of the gate and the grooves in which it works, and now through this simple device the hand of a little child can raise and lower these immense portcullises of steel.

In the United States Government building, one of the great sights of the fair is the mint, where every process in the making of coins is shown, from the melting of the ingot to the striking of the die. In the Postoffice Department, the visitor sees the beautiful machine whereby stamps are canceled and postmarks are affixed with almost lightning rapidity, hundreds of envelopes passing through in a few seconds. In the Department of the Patent Office, are several of the very latest inventions to be examined, among them being one of the installations of wireless telegraphy that are scattered about the exposition.

Continuing our round of main buildings, we now come to the Palace of Mining, where we have the Pennsylvania coal-breaking machinery in operation, already described in a previous article. In the next building along the line, that of Education, Germany makes a special feature of Roentgen-ray machines, demonstrating the working and freely allowing visitors to inspect their bony anatomy. I have already dealt fully with the Palace of Electricity, but the latest form of railroad transportation, the monorail electric system, has still to be noticed, and well repays attention. This is the high-speed system that is being installed in England to connect the two populous cities of Manchester and Liverpool. The inventor is T. B. Behr, and the contract speed is 110 miles per hour. The road was authorized by Parliament only after its absolute safety was testified to by the leading engineers of the world. The total length of the new line will be thirty-four and one-half miles, and there will be a double track throughout. The monorail, on which the car is slung on either side, is supported on a succession of trestles shaped like the letter "A." Besides this there are four grinding rails, which prevent vibration, and also, by flanges on the wheels, eliminate the possibility of the car being thrown from the track. One single carriage forms each train, and is so built as to admit of being placed over the trestles like a deep saddle. The electric motors are placed near each end of the carriage. An electrical system of signaling, largely automatic, will be employed. Only passengers are to be carried, and the fares will not exceed those ordinarily charged on English railways. The traveler will

Yet so vast is the field that even in this most vast of all exhibitions there are noticeable gaps. For example, the great steel-making industry appears to be wholly unrepresented. Likewise, for all the evidence here made visible, we might never know that the United States, both on the Atlantic and on the Pacific side, has enormous shipbuilding interests. The shipbuilding yards at Newport News, West Virginia, with a frontage of two miles to the James River, cost over \$13,000,000 to install, and are equipped with what is universally admitted to be the most extensive and the finest labor-saving plant in the world. Yet at St. Louis there is not so much as a hint of its existence. In like manner, although there is an abundance of the finished goods on exhibition, there is no demonstration of the great American textile industries on the manufacturing side. Blanks were inevitable; but it seems strange that three such important enterprises, perhaps the most important of all, should be among the absent ones.

LOCOMOTIVE TESTS.

In an article intended for the general reader I can touch only very lightly on the subject of machinery. The engineer, the mechanic, the man specially interested in any particular line, will of course turn to his technical journals, or, better still, he will come to St. Louis and study all the new things shown for himself. But I can indicate, here and there throughout the buildings, points of interest to every intelligent observer, even though not specially trained in the intricacies of mechanism.

To begin with, let me explain briefly the meaning of the railway locomotive tests, to which reference has already been made. These are intended to ascertain the precise differences in results due to variations of design in the several types of engines generally used throughout the United States. For example, the different length of flues and the different grate areas are being investigated with a view to arrive at general principles. The question of fuel consumption also comes into account. Results are shown by the speed registered in miles per hour, the revolutions of the driving wheels per minute, and the horse power being developed at the draw bar. The men in charge of the experiments are among the ablest and best known railroad engineers in America, so that their findings will be authoritative. For it is obvious that no such exact comparisons between types of engines can be made on the actual road, where conditions vary every day and almost every hour.