

time, which latter takes effect at this point. At Detroit a stoppage of about 45 minutes was made, and, shortly after resuming the journey, the delegates passed the scene of a somewhat serious collision, two freight trains having been both wrecked through trying conclusions with each other. As they approached Chicago, which was reached about ten o'clock in the evening, they witnessed the great World's Fair in full swing, with the grounds brilliantly illuminated, the shops or stores, as they are called in America, open, the cars running, and nothing to indicate that there was any rest for either man or beast in that great Western city on Sunday. The delegates took up their quarters in the Hotel Thomas No. 1, a large, new building in 60th Street, close to the grand central entrance to the Exhibition.

AT THE WORLD'S FAIR.

AN IMPOSING SHOW.

THE TERRIBLE FIRE.

MINES AND MINING.

COAL-CUTTING MACHINERY.

HOLING LONG WALL WORKINGS.

TRANSPORTATION BUILDINGS.

REMARKABLE LOCOMOTIVES.

IRON AND STEEL.

THE MONSTER STEAM HAMMER.

A BIG STEEL BAND SAW.

THE TINPLATE INDUSTRY.

(From the Dundee Weekly News of August 19.)

Writing from Chicago on July 11 the Conductor says:—The members of the *Dundee Weekly News* Expedition have now had two days' experience of Chicago. It is a huge city, with several splendid parks, handsome boulevards, and huge buildings, and is about 22 miles long by 9 or 10 miles broad, embracing a population now estimated at about 1,600,000, and composed chiefly of Germans, Americans, and Irish. The Columbian Exposition, or World's Fair as it is familiarly named here, is located in Jackson Park, nearly 600 acres in extent, on the shore of Lake Michigan, six or seven miles south of the business portion of the city in which are the celebrated "sky scrapers" or "neck-breakers" of buildings 12, 14, 16, 18, and 20 storeys in height. Connecting the World's Fair grounds with Washington Park, a recreation ground with an area of nearly 400 acres, is the Midway Plaisance, a mile in length, containing representations of various nationalities. The total cost of the Exhibition, including the laying out of the grounds, came to about \$30,000,000 or six millions sterling, and Chicagoans freely admit that the receipts so far have been disappointing. This they attribute to the railway companies having declined up to the present to reduce their rates in order to induce outsiders to visit the Fair. The daily working expenses have now, it is stated, been cut down from

\$28,000 (£5600) to \$13,000 (£2600), while the average daily attendance has risen to about 100,000, and all look confidently forward to a large increase of visitors in autumn, when it is expected the railroad companies will reduce their fares. The Exhibition is now also practically complete, the Viking ship being expected to-morrow.

The delegates were eye-witnesses of the great conflagration which yesterday destroyed the cold storage warehouse—a building within the grounds but quite distinct from the Exhibition buildings proper—and which caused the loss of about fifty lives, including twelve firemen and four Columbian guards. The scenes witnessed in the Fair grounds during the conflagration were positively indescribable. The firemen, some of whom had bravely ascended the tower and the roof of the warehouse in their efforts to save comrades and the workmen in the building, acted like heroes, but without avail. The building was a complete shell, and when the flames ascended, and cut off the escape of the men who were on the tower, the scene was sickening. About 100,000 visitors were within the grounds, and while women were screaming and fainting in great numbers all around, almost all the men were also greatly excited, and shouting wildly. Some of the firemen escaped by ropes, although they were fearfully burned, but the fire quickly increased its grasp of the tower, and then a girdle of fierce flame barred the way to the safety of those who remained on the balconies. A few attempted to reach the ground by means of ropes, as others had done before them, but the fire had now burned these through, and then they fell about 80 or 100 feet into a burning oven. Others retained their foothold until their hair and their clothes were burning, when in sheer desperation they leapt into the air and shared the fate of those who had gone before them. A small number stood out to the bitter end, and these went *en masse* with the whole upper part of the tower, when, amidst a piercing scream of horror, it toppled over and fell into the blazing furnace beneath. Such a scene is one which can never be forgotten by those who witnessed it. As instances of American *sang froid* under such circumstances, it may be mentioned that during the exciting and heartrending scenes above depicted some artists were observed coolly sketching the various incidents of the catastrophe, while others were busy with cameras. Everything was in full operation to-day as if no such disaster had just occurred. The heat during the past two days has been intense, and even the natives are complaining of it. Appended are the reports of the delegates on the Expedition.

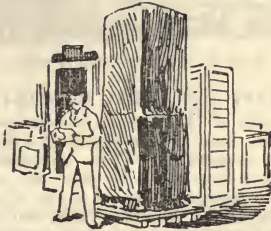
MINES AND MINING BUILDING.

Mr Robert A. Muir, Hill of Beath, Fifeshire, who made an inspection of this department at the World's Fair, reports:—The Mines and Mining Building is located at the southern extremity of the Western Lagoon or lake. It is 700 feet long and 350 feet wide. Its architecture has its inspiration in early Italian renaissance. There are entrances on each of the four sides, those of the north and south fronts being the most prominent. To the right and left of each entrance inside start broad flights of easy stairs, leading to the galleries. The galleries are 60 feet wide and 25 feet high from the ground floor. The interior space enclosed is 630 feet long, 100 feet high at the centre, and 47 feet high at the sides. This space is spanned by steel cantilever trusses, supported on steel columns. The clear space in the centre is 115 feet. The cantilever system, as applied to roofs, was never used on so large a scale before. The cost of erection was £50,000. Entering this building by the northern

entrance, the first exhibit that takes the eye is a large obelisk representing the valuable minerals of Pennsylvania in their order of stratification. Further along we come to West Virginia's exhibit, which shows samples of the famous coal from the Pocahontes Colliery, which in some cases is mined for from 40 to 45 cents (1s 8d to 1s 10½d) per ton; in fact, it is

Lying on the Surface

in some places and only required to be quarried. It was from this colliery that the Majestic and Teutonic steamships got supplied for their record passages across the Atlantic. In the British exhibit the most notable was the large piece of cannel coal, weighing 11 tons 14 cwts., from the Wigan Junction colliery. This piece of coal, if



made into gas, would be equal to 182,344 cubic feet of gas of 4074 candles per cubic foot. Another exhibit which took the eye in this section was a large milk cow carved out of salt rock. Africa was well represented by washing plant from De Beers diamond mines, Kimberley, which could be seen in full operation from the shovelling in of the ground to the washing out of the diamonds. In the Ohio section the system of working the coal was shown by having a short length of roadway formed in the seam and the working face at which men were represented as working and having all the tools and appliances necessary for getting the coal.

Coal Cutting Machinery

was in great abundance, some of which were adapted for narrow work and some for long wall system. In talking to the attendant of the Jeffrey Coal Cutting Machine used for narrow work, he said he would guarantee his machine to cut 6 feet deep by 3 feet 6 inches broad in five minutes, and that it would take one minute to shift it for taking another cut—that is to say the machine could cut, or as we term in Scotland "hole," in a narrow place of 14 feet wide and 6 feet deep in about 25 minutes. Of course the coal had to be blasted down after the machine had cut it. This machine is attended by two men when in operation, and is driven by compressed air or electricity. It has been in use for fourteen years, and costs about \$1460 (£280), and is used very extensively in the States. There is another machine exhibited which is called the Stanley Coal Heading Machine. This machine instead of making a horizontal cut makes a circular one, and leaves a solid core which is taken down by hand labour. These machines form a circular roadway; but sometimes two are put together and work side by side, and form a roadway of rectangular section with rounded corners. This machine is driven by compressed air, and with two men attending is capable of cutting in a distance of 30 feet in ten hours, or I may say 8 narrow places of about 4 feet each. The machine exhibited would form a roadway 6 feet diameter—cost of machine, \$3000 (£600). There were several other machines shown for

Holing Long Wall Workings,

and one of them called the Mitchell mining

machine was capable of cutting 2000 square feet of coal in ten hours, with two men operating—that is to say, it would make a cut of 4 feet deep along a wall face 500 feet long in that time. The cutters of this machine were set into a strong bar, which projected about 5 feet from the side of it, and which was revolved at a good speed by suitable gearing driven by compressed air. The machine was driven forward by fastening the end of a chain to a prop, and winding the other end on a drum which was placed on the framing. There was also a great variety of hand power drilling machines, also rotary and percussion drilling machines, driven by compressed air and electricity, and I saw one of the cores from a diamond bore, which was 20 inches in diameter. In another department I saw a model of the kind, chaudron method of boring and tubing a circular shaft, all the men and machinery being at the surface, and no water pumped until the shaft was completed through the watery strata. This method is used only when the rock is very hard and a great quantity of water given off. There was also a few exhibits showing the method of

Sizing and Cleaning the Coal

and dress, also of electric locomotives for conveying the coal underground, some of them being 60 horse power; also methods of elevating and conveying the coal, &c., above ground. There is also a machine which is said to be able to pump the coal from the mines to the market, and I cannot do better than give a copy of the notice which was put on it and leave the reader to draw his own conclusions:—"This mixture is one-half coal and one-half water. The water is vehicle of carriage. Its feasibility has been fully demonstrated by experimental tests of pumping the various kinds of coal an aggregate of over 10,000 miles. These tests indicate that coal can be carried to market from the mines for 1-10th the present average charge by railroad. It is also in better condition for all the principal purposes of use." The construction of the machine is simply a ram pump, having suction and discharge pipes in the ordinary way. I don't suppose it is in actual use in any place. I saw another instrument called the

Shaw's Standard Gas Test

and detector for fire damp in mines. It was so sensitive as to be able to register to the 1-1000th part of a mixture of gas and air. It could also give the proportion of chokedamp and air, but it was so large and delicate that it could not be taken down a mine, so that samples of suspected gas had to be taken to it in bags, and pumped into it along with air. There was also a display of winding engines and pumps, some of them in use. There was also some splendid models of collieries, one of the best and most complete being one from H. C. Frick Coke Company, the construction of which had been carried out under the supervision of their superintendent, Mr Robert Ramsay, who is a native of Crossgates, Fifeshire, a man who, by his own personal effort, has risen to one of the highest positions of mining in the States.

TRANSPORTATION BUILDINGS.

Mr D. G. Watson, representative of the Railway Servants, writing on July 10, says:—"To-day I had a visit to the World's Fair. On entering the grounds I held for the Transportation Buildings, which are situated at the southern end of the west side, near the Horticultural and the Mining Buildings. This building is easily recognised by the large entrance, which is very richly decorated and painted. On entering you can see all sorts of the very best plant used for transport by road, rail, and sea. The railway plant is especially well represented. There are a great many locomotive,

some from France and England, and all places in America. There is one built for the New York, Erie, and Western Railway by the Baldwin Locomotive Shops, Philadelphia, U.S.A. This is the largest engine on all appearance in the Exposition. Its dimensions are as follows:—Cylinders—High pressure, 16 by 28 inches; low pressure—27 by 28 inches. Driving wheel, 50 inches diameter. weight in working order, 195,000 lbs.; weight on driving wheels, 172,000 lbs.; total weight engine and tender, 284,420 lbs.; total base of wheels, 27 feet 3 inches; driving wheel base, 19 feet 10 inches; engine truck wheel, 30 inches; boiler and firebox, both steel tubes, iron; diameter of boiler outside, 76 inches; tubes, 12½ feet long; firebox, 10 feet by 11 feet, 8 feet 2½ inches inside; Working steam pressure per square inch, 180 lbs.; water capacity in tender, 4500 gallons; coal, 8 tons; diameter of tender wheels, 33 inches; metallic packing, two injectors, all fitted with the Westinghouse air brake. This engine is 10-coupled, with small wheel in front; four cylinders. Both piston rods are wrought on the one connecting rod; two four-wheeled bogies under tender. This engine is built with a cabin for the driver on the centre of the boiler, on which all the handles can be wrought. The fireman has his own place, and two firebox doors, a steam gauge, and a set of fire bar shakers, that is all that is on his footplate, with the tender behind. This engine is designed for

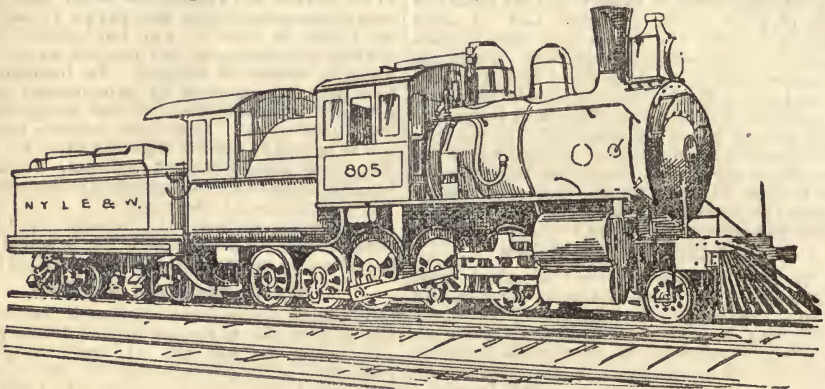
driving springs to centre of hanger, 4 feet; steel boiler, 251 tubes, two inches diameter; length of tubes, 11 feet 10 inches; inside length of firebox, 107 inches; inside width of firebox, 33 inches; diameter of dome, 31½ inches; height, 22 inches; working steam pressure, 180 lbs.; grate surface, 24½ square feet; heating surface in firebox, 149 square feet; heating surface of the tubes, 1544 square feet; total heating surface, 1693 square feet. Height of engine from rail to top of funnel, 14 feet 10½ inches. Engine 999, claimed to be the fastest locomotive in the world, will be described in a subsequent notice.



OLD LOCOMOTIVE JOHN BULL.

IRON AND STEEL EXHIBITS.

Mr Dunlop, of Motherwell, representative of the ironworkers, reports in connection with the iron and steel department:—The manufacturers of Great Britain have made no show whatever, very few of them being represented at the World's Fair. Perhaps they think it does not pay, and then there is always an enormous expense in connection with



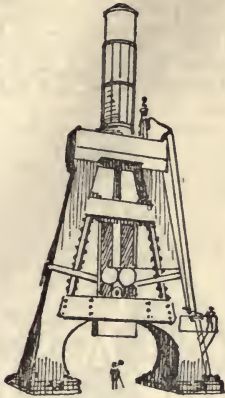
BALDWIN LOCOMOTIVE.

Very Heavy Lifts,

but not for a great speed. There is a four-wheeled coupled bogie express engine named the Director-General, built by the Baldwin Locomotive Works from designs, other than the compounding of the cylinder, by Mr George B. Hazlehurst, general superintendent, motive power, B. & O.R. The Director-General will at the close of the Exposition be assigned to serve on the Royal Blue, Limited, between Washington and New York, and it is believed will equal, if not eclipse, the record now held by a Royal Blue engine of a mile in 37 seconds, which is at the rate of 97 3.10 miles per hour. The Director-General's actual weight in working order is 126,780 pounds; weight of tender with fuel and water 72,080 pounds, making the whole weight in service in round figures 100 tons. The wheel base of locomotive is 22 feet 4 inches, and of tender 17 feet. Total length of engine and tender over all is 59 feet 6½ inches. The diameter of the high pressure cylinder is 13½ inches, of low pressure cylinder 23 inches, stroke 24 inches, steam ports 24 inches by 1½ inch, circular exhaust ports the same piston valves; diameter of driving wheels, 6 feet 6 inches; truck wheels, 3 feet; length of

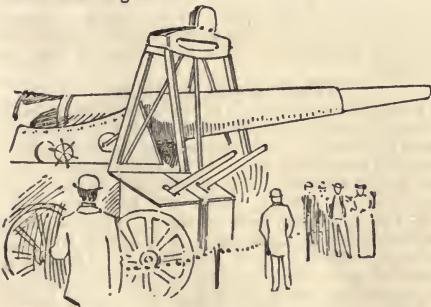
a large stall. But no matter what our manufacturers think there is one thing sure, that is—our enterprising friends the Germans must find it pays well, as they undoubtedly have the finest and largest exhibit in connection with the iron and steel trade. In the exhibits in the iron trade the Farnley Iron Company, Yorkshire, show some good examples of their products, and although steel to a large extent has superseded iron the continual use of this iron proves that it gives entire satisfaction. The special fitness of some classes of iron for special purposes, as safety in welding, and where resistance to sudden shocks is important, still keeps the trade in the hands of a few. The statistics of the British Iron Trade Association prove that in spite of bad trade Britain produced 1,500,000 tons of puddled bars last year. The exhibits of Stumm Brothers, of Germany, have a splendid appearance, and they have displayed great tact in the manner of exhibit. Wm. Jessop & Sons, Sheffield, and John Brown & Co., of the same place, have a good show, but the fact is plain to anyone who knows the extent of our iron and steel trade that as a rule our manufacturers have stayed away. Among American manufacturers the best exhibit is undoubtedly that of the

Bethlehem Iron and Steel Company, Pa. On the centre of the floor they have a full-size model of their steam hammer,



The Largest in the World.

It is a great piece of mechanical skill. The weight of the piston rod and tup falling parts is 125 tons. The piston rod is 40 feet, with a full stroke of 16½ feet. The total weight of the hammer and foundations is 2400 tons. The same firm also make it plain that they can turn out anything in that line, as they have a fine show of armour plates, breech-loading guns, and a model of a huge steel ingot for an armour plate, 13 feet by 3 feet 6 inches by 4 feet 4 inches. From Sweden the Sandvik Steel Works have some splendid exhibits. They show a steel band-saw, the largest in the world; it is 220 feet long 12 inches wide and number fourteen gauge. In the above department there is no mistaking the fact that Krupp, of Essen, Germany, have the largest and best exhibit at the big show. They have a splendid building for their own ordnance, and to place such a large amount of material of such great dimensions away one thousand miles inland on the American Continent only tends to show that they are determined to fight their way in and keep abreast of all their competitors. In the centre of this building sits



The 120-Ton Krupp Gun,

the largest in the world. The difficulty of shipping such a large piece was great. It was sent on a special truck to Hamburg, where there is a large crane, and again they had to find a place on the coast where there was a heavy crane to lift it. One of the great railways had special trucks made in America ready to take it on its long journey,

where it is now surrounded by crowds of persons daily. They also show two fine ship guns, one a 65-ton and one a 45-ton. Men-of-war-men are there daily working the guns, and showing their method of loading and working. The big gun has a range of 20 miles, and the smaller ones of 14 miles. The large shaft with great propeller blades fixed on end is a great attraction for the visitors, also the big cast steel stem for an armour-clad vessel. They also show a boiler end plate 12 feet in diameter, 1½ inch thick, weight 3 tons; and also a plate 65 feet long, 11 feet 3 inches wide, 1½ inch thick, weight 16 tons. One of the departments of industry in which America is behind ours is

The Tin Plate Industry.

They are trying to establish it, but so far it has not been a great success. At the same time they are pushing on, and there are five or six American manufacturers with good samples of their work to be seen in the Mines and Mining Buildings, showing the process from the black sheet to the finished article, and some of them have a capacity of 3500 boxes per week. Another thing of special notice is the gradual advance of aluminium. This metal is shown by the Pittsburg Reduction Company. The metal is made ductile and malleable, and made into all sorts of articles, useful and ornamental, and nicknacks of every description, one large case being filled with horse shoes. They have an establishment in England as well as in the States, and there is no doubt but what the metal has a great future before it.

PAPERMAKING AT THE WORLD'S FAIR.

Mr William Smith, papermaker, Denny, reports:—In the World's Fair there is a papermaking machine making paper out of wood pulp; that is, wood boiled with a very high pressure and a certain amount of chemicals added, so that when it comes to the paper mill it is very white. Thus it does not take much work before it is made into paper. It is put into the beating engines, and is beat in them for three hours; then it is run down into a chest or vat, where there is an agitator going round so as to keep the pulp well mixed up. It then runs into another beater, called the Marshall perfecting engine—that is, a beater for clearing out any knots or long fibre that have passed the other beaters. It is then pumped up into a service box by a centrifugal pump, then run into the strainers or screens—that is, brass plates with very narrow slits in them. The pulp goes through these slits, and leaves any dirt or knots out. It then passes into the breast box at the end of the machine, then on to the wire cloth. As the wire runs on the pulp flows on to it as it moves along. So much of the water runs through the wire into the save-all. It then runs across two vacuum boxes. To these vacuum boxes is attached a pump, which draws the water out of the pulp as it goes across them. It then passes on through the coucher rolls, and then on through the press rolls on the top of a belt. The press rolls are for taking the water out and firming up the sheet. It then passes on to the drying cylinders. There are seventeen of them heated up with steam, and as it passes along it gets entirely dry when it comes to the colander rolls. There are two sets of rolls. One set has five rolls, the other set has nine rolls, all running on top of each other. It then passes in through each of these rolls, and comes out with a fine, smooth surface. The paper next passes on to the slitter and winding machine. It is there cut into certain breadths, and worn into webs 3 to 4 cwt., and is now ready for the printer. There is also some very fine samples of paper on exhibit of ledger, writing, printing, and parchment paper. There is also a good assortment of water-

proofing, paper building, and sheathing papers. There is a telephone cable made with paper, with a lead shell over it, with the wires in through the paper, which shows that the capabilities of paper for scientific purposes have by no means been exhausted.

AT THE WORLD'S FAIR.

(Second Report.)

THE NAVAL EXHIBITS.

THE WHALEBACK STEAMER.

HORTICULTURAL BUILDINGS.

PROFITS OF FRUIT-GROWING.

PROSPECTS OF GARDENERS.

THE ELECTRICAL BUILDING.

AN INTERESTING EXPERIMENT.

FURNITURE AT THE FAIR.

(From the Dundee Weekly News of August 26.)

Sailing Ship Santa Maria.

Mr Brown, of Govan, shipbuilding representative, writes:—I was all through the full-sized model of the Santa Maria. It is a *fac-simile* of the ship in which Christopher Columbus sailed when he discovered America. It is 71 feet long, 25 feet beam, 12 feet 6 inches depth of hold, and has a displacement of 223 metric tons. There is a crew at



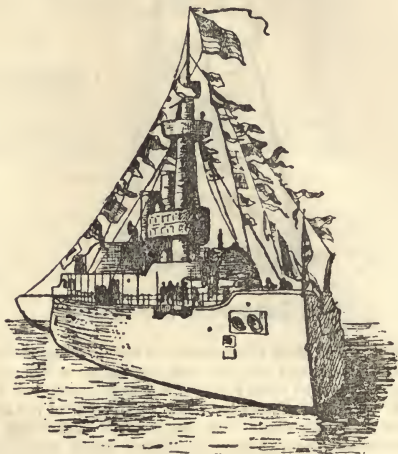
THE SANTA MARIA.

present on board of fifty-two all told. In the after part there is what is called a half deck about six feet high, on which is placed the Admiral's cabin, which has two large windows right in the stern. Over the cabin is the poop or quarterdeck, which stands very high, and on the rails of which are two small cannons. The forecabin is very high also. The ship appears to have been built very strong, the ribs or frames being very thick, and must have been seaworthy.

Man-of-War Illinois.

The full-sized model of the U.S. man-of-war Illinois is really a most remarkable exhibit. It lies (or is built rather) close to the pier as if it were moored to the wharf. It is built on a foundation

of piles, and above water-line has all the appearance of a real man-of-war line of battleship. Officers, seamen, mechanics, and marines are detailed off, and the discipline and mode of life on naval vessels are completely shown. Her dimensions are:—Length, 348 feet; width amidships, 69 feet 3 inches; and from the water-line to that of the main deck, 12 feet. Right amidships on this deck is a superstructure 8 feet high, with a hammock berthing on the same, which is 7 feet high, and



WARSHIP ILLINOIS.

above these are the bridge, chart-house, and the boats. At the forward end of the superstructure there is a cone-shaped tower called the "Military Mast," near the top of which are placed two circular "tops" as receptacles for sharpshooters. There are rapid-firing guns on each of these tops. The height from the water-line to the summit of this military mast is 76 feet, and above is placed a flagstaff for signalling. The mounted battery comprise four 13-inch breechloading rifled cannons, eight 8-inch do., four 6-inch do., twenty 6-pounder rapid-firing guns, six 1-pound do., two Gatling guns, and six torpedo guns. All these are placed and mounted as in the genuine battleships. On the starboard side is shown the torpedo protection net, stretching the entire length of the vessel. Steam launches and cutters ride at the booms, and all the outward appearance of a real ship of war is imitated.

Whale-Back Steamer.

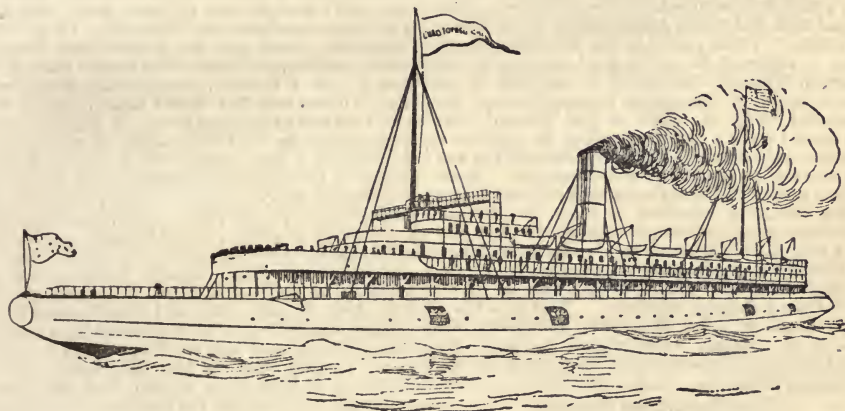
I had the opportunity of seeing the whale-back steamer Christopher Columbus, which is plying in Lake Michigan. It is claimed to be the newest thing in transportation. As its name implies, it is not unlike a whale. It is cone-shaped at each end, 362 feet in length, with 42 feet of beam. The hull is entirely built of steel. There are nine water-tight compartments, and it carries 960 tons of water ballast. The Christopher Columbus is built so as to offer the least possible resistance to the water, and floats like a duck, there being hardly a ripple caused by her motion through the water, attaining a speed of 20 miles per hour. There are five decks, affording room for no less than 6000 passengers. There are the main, promenade, turret, and hurricane decks above the steel shell, and in the shell another deck for the refreshment-rooms and dining-rooms. The grand saloon is on the promenade deck. It is 225 feet long by 30 feet wide. The ladies' cabin is aft; this saloon

and the ladies' cabin are finished in oak and mahogany, and are luxuriously furnished—cushions, curtains, hangings, and easy chairs being part of the furniture. In the centre of the saloon rises a beautiful fountain, from which the water trickles back to an aquarium below. The windows are engraved with a series of designs which form a complete history of navigation, embracing designs of every sort of ship from Noah's ark to the whale-back. Seven turrets support the decks far above the lashing of the waves, no matter how high they roll. She carries no less than sixteen large life-boats, besides a number of life-buoys in the form of settees. The steel shell is equipped with triple-expansion engines with cylinders of 20, 24, and 70 inches. The engines have a capacity of 2600 horsepower and are capable of developing a speed of twenty miles an hour. She was built in the yard of the American Steel Barge Company, in West Superior. The steel shell was completed and launched in seventy days. It cost nearly \$500,000, equal to £125,000 sterling. The whaleback vessel is an invention of Alexander M'Dougall, a Glasgow born and Canadian nurtured Scotchman. Captain M'Dougall has been for twenty-five years a well-

Barge Co. is the largest owner of freight boats on the great lakes, the Christopher Columbus being the first whaleback passenger boat, and numbering twenty-eight in the list of boats built.

FURNITURE AT THE WORLD'S FAIR.

Mr Logan, Glasgow, reports:—After walking through the various furniture courts of this great Exhibition, where nations have met on common ground to compare notes, the first thing that struck me was the poor show made by Great Britain in comparison with France and Italy, thus losing a splendid advertisement. However, we must be thankful that there are a few who have had the courage and enterprise to enter into this great international contest, and to them is due every praise for saving this portion of the British section from being desolate. What the British haven't in quantity they have in quality. This is shown very strikingly in the style, decoration, and workmanship of our furniture. The principal exhibitors in the British section are Messrs Hampton & Sons, London. They give a reproduction on a reduced



WHALE-BACK STEAMER CHRISTOPHER COLUMBUS.

known man on the great lakes, where he arose from the position of common seaman to that of captain or master of the larger passenger and freight steamers, until finally in the early seventies he abandoned "sailing" to become a vessel or shipping agent at Duluth, in order to carry out an idea he had long entertained that he could effect a revolution in vessel architecture and construction. In the summer of 1888, after having spent ten years in experimenting and getting together enough money to build a steel vessel according to his completed model, he launched the "101," a steel tow barge capable of carrying about 40,000 bushels of wheat. It was a success from the start. One short season with the "101" enabled him to secure capital to extend his operations. After building six or seven vessels the next year at his old yard in Duluth, Minn., the American Steel Barge Co., which he and his associates had organised, removed to West Superior, Wis., in the spring of 1890, where they equipped one of the largest and finest shipyards in the United States, covering at the present time, with its dry docks, fifteen acres of land and water slips. At this yard, shipbuilding has ever gone steadily forward, until now the American Steel

scale of the banqueting hall of the famous
Hatfield House,

the residence of Lord Salisbury. It is constructed of solid oak, in the Elizabethan style, and is intended to exemplify the application of high art to house decoration. This Hall is acknowledged to be the finest specimen of Elizabethan work in existence. The space at my disposal would not allow me to speak of all the exhibits in the British section. The one I have singled out will serve for comparison. On passing through the French section the first idea that strikes the mind is the magnitude of the exhibits. The show of furniture and woodcarving is of the richest kind. The French designers seem to confine themselves almost entirely to the styles of their country (Louis xv. and xvi.) They show great ability in reproducing the work in those styles, and practice in that class of work gives them an advantage over all other countries. It seems to me that the French manufacturers consider the style and beauty of a piece of furniture of the most importance; its usefulness being quite a secondary matter. The display of woodcarving in the French department is of a very high order of merit, which indicates a profound knowledge of art.

I now turn my attention to the Italian division, and here, as I expected, found furniture and

Carved Woodwork

of rare excellence. The Italians do not appear to be particularly good at ordinary decorative carving—certainly not equal to the French—but in their own particular speciality they distance all competitors. In representing Nature in any of its varied forms, especially the human figure, they are always excellent, but when they descend to conventional ornaments they are not usually so successful. There are many articles of furniture decorated, and in some cases overdone, with carving. This applies to cabinets especially. The furniture is almost exclusively of one character, which is Italian renaissance, although it is somewhat different in detail from what is commonly called Italian renaissance in this country. In comparing the work shown by

France and Italy

in the carving, with the Italians smoothness of surface is kept almost entirely for the figure, foliage, flowers, and ornament being treated quite differently, with tool marks in them distinctly shown and emphasised. With the French carver, on the other hand, nearly all the work is finished with a monotonous smoothness, which proves great manual skill, but which destroys most of the charm and effect. I then passed to the American courts, where I expected to see a good display in the American furniture department on account of the artistic tastes of the people; also, because the Americans being at home, it was natural that they should make a strenuous effort to produce a creditable collection. All the manufacturers of any note in America appear to be represented. Some of them showing splendid specimens of art. Most of the furniture exhibited is after the French renaissance style, preference being given to it probably because it is effective and beautiful in detail, and affords a wider scope for the woodcarver. By far the largest and best exhibits of furniture are shown by the Grand Rapids, Michigan. This is a place on the shores of Lake Michigan, and about 100 miles from Chicago, which claims to have the largest factories in the world, of which there are 62, and employ 9000 men. Grand Rapids is

The Furniture Centre

of the United States. Speaking of the American exhibits as a whole no one can deny that there is a fine collection of artistic furniture produced by judiciously combining the various branches of the trade, but when compared with the British exhibits there is certainly little that our first-class workman can learn from his American cousin. Among the exhibits in the American section there is one of the most recent triumphs of the cabinet-maker's art. It is a combination folding bed, billiard table, settee, and chest of drawers. The whole thing doesn't take up more room than an ordinary upright piano.

HORTICULTURE AT THE WORLD'S FAIR.

Mr Sinclair, of Cambuslang, a most enthusiastic and successful horticulturist, made an inspection of this department, and reports as follows:—The horticultural building forms a great conservatory 1000 feet long, with an extreme width of 286 feet. The general plan is that of a central pavilion, with two end pavilions each connected with the central pavilion by front and rear curtains, forming two interior courts, each 88 by 270 feet. The courts are beautifully decorated in colour, and planted with ornamental shrubs and flowers. The central pavilion is roofed by a dome 187 feet in diameter and 113 feet high. This dome is utilised for the

display of the tallest palms, bamboos, and tree ferns that could be procured. There is certainly under this dome a number of very large specimen palms, but the variety is not what one might expect to see at a World's Fair. Being introduced to Mr George T. Powell, of New York, Director of the Department of Horticulture of that State, he kindly consented to take me round the various departments of the fruit exhibits, each State having its own separate stall. Going over the exhibits from the State of New York, it was astonishing to see the varieties of canned fruits and also the fine exhibits of ripe fruits, especially among the tomatoes. They had a specimen tomato which weighed 4 lbs. In coming to the State of California stall, there is a large monument done up from top to bottom with oranges, a true representation of the Bunker Hill Monument, Boston, 16 feet square at the base, and rising to a height of 30 feet. The exhibits here of all kinds of fruit were very fine. In conversing with Mr Goodman, who had charge of the stall for the State of Missouri, he said he believed that what they wanted in America was to get the people skilled in how to grow fruits of all kinds profitably, and for this purpose they had formed a society so that in each State two lectures could be given every year on how to plant, prune, and keep in a healthy condition their orchards. He said that twenty-one years ago he planted five hundred budded peaches, and some of his friends warned him that it was a mistake, because they would never bear. Others said they would be so plentiful they would not sell at a paying price. But in spite of all these predictions the fifth summer he netted a crop of \$475, and they continued to pay well for a number of years, but hard winters set in and proved very fatal to many of his peach trees, so that of late his peaches have not paid. In the conversation I had with Mr Goodman, I could clearly see that the various goods exhibited were fruits gathered far and near in every State, clearly showing that in America, as well as at home, if any one plants a fruit tree of any kind and lets it stand to the autumn without care or attention and then goes and seeks fruit, he need not be disappointed at finding none. Passing along in this department we find that every stalker is certain that his State is the best and his exhibits the finest in the Exhibition. We now come to the department illustrating the appliances, methods, &c. I inquired at Mr Powell what were the wages of men employed in gardening. He told me the average wage of gardeners well up in their profession would be from \$50 to \$60, or £10 to £12 per month. Mr Powell, who is superintending New York exhibits, has all its varieties of fruit correctly named, and each one described as to the soil and climate it is most likely to do well in. Great credit is due to Mr Powell for the pains and trouble it must have given him to go over all the varieties under his charge. In the canned goods department alone it is valued at \$10,000.

FORGING BY ELECTRICITY.

Mr Ebenezer Bennett, electric engineer, Newcastle-on-Tyne, reports regarding the Electrical Buildings:—I am really surprised to find such a poor show as there is in this department after all we have heard. The only exhibit worthy of notice (that is where anything new is to be seen) is that of the Electrical Forging Company of Boston. An exhibition of the process of forging and tempering by electricity of metals is here given with great success. Metal that is heated by electricity and forged under that heat is stronger than similar metals heated in the fire. A claim they hold for their process is that it wastes little or no material,

and is so quick and accurate in its operation that its productive capacity is far in advance of any other process in mechanics.

It Saves Labour,

material, and time, and so reduces the cost of production that it must inevitably control the manufacture of any article that can be produced by it. The secret of electrical forging lies in the fact that by this process metal is heated all through evenly, whereas in an ordinary forge a bar of iron or steel is in danger of burning on the outside before the inside of the metal gets hot enough to work. I saw an exhibition of forging to-day which showed perfect control over the degree of heat. It also has the advantage of adding no gases or other impurities with the metal. The exhibition to-day was the heating of a bar of iron to a white heat in water. The current is passed through an ordinary pailful of water, and the iron being plunged becomes

Red-Hot in Less Than Thirty Seconds.

The current was then turned off, and the iron was cooled in the same pailful of water. This exhibition gave general satisfaction to the great crowd of onlookers, many of whom carried away pieces of forgings as a souvenir of the Exhibition. Mr Geo. D. Burton, of Boston, claims to be the inventor of the electrical forging. That I question. If my memory serves me right, it was a Scotsman of the name of Thomson who was the inventor. Be that as it may, the economy of electric forging is a subject well worth studying.

BUILDING MATERIALS.

Mr Sinclair reports:—Side by side with the Electrical Building stands the exhibition hall of mines and mining. The building is but one-storey in height, the main cornice being 65 feet from the ground. Its design follows no arbitrary lines, but in simple and straightforward elegance is all that a great exposition building should be. The entrances are upon each of the four sides of the building, the principal ones upon the ends. These are each 110 feet high and 32 feet wide, opening into lavishly-decorated vestibules 88 feet high. Part of the mining exhibits consists of marble blocks of about 10 inches square of various hues of colour, also granite and sandstone in great variety. Messrs Auld & Conger, of Cleveland, Ohio, have a beautiful class of

Exhibits in Slate.

They are from $\frac{3}{8}$ inch to 2 inches thick, and are greatly used in schools instead of plastering or wood lining, the walls being lined with this slate are used for figuring or writing upon instead of black boards, and from what I saw of it, I consider it well adapted for that purpose. The gentleman who looks after this stall is an Edinburgh man, but has been with the above firm in Cleveland for several years. On inquiry as to the rate of wages in that district, he said masons were paid 40 cents

per hour, and wrought ten hours per day and eight on Saturday. Speaking of his own experience, he said that he was

As Comfortable in Edinburgh

as ever he had been in America. He also told me he had one of the most economical and industrious wives that was to be found in America, and she could not keep his house and four children on less than from \$10 to \$12 per week, and that sum did not include clothing. On account of the great loss of time in the winter it made it sometimes very difficult for a man with a house and family to get along as he ought without saving money at all. Another speciality in this department was the splendid assortment of pressed brick, both plain, ornamental, and moulded. These bricks were said to be homogeneous, and could be carved more easily than stone. They are of an exceedingly rich bright cherry colour, and are all made from natural clay. They have a closeness of texture and uniformity of colour, which makes them very suitable for facing good jobs. They are largely used in building both in and around this great city that the Americans boast of as having grown up like Jonah's gourd.

AT THE WORLD'S FAIR.

(Third Report.)

WORLD'S FASTEST ENGINE.

A FAMOUS SNOW PLOUGH.

WEAVING AT THE FAIR.

MECHANICAL NOVELTIES.

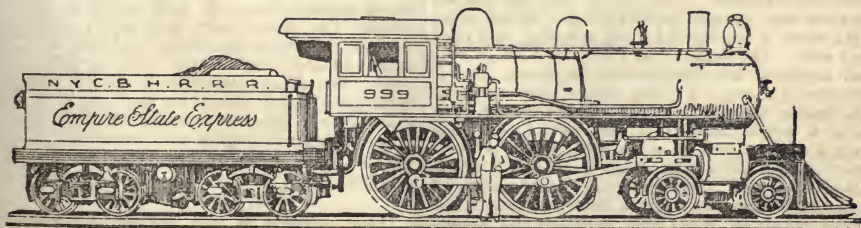
THE WOMAN'S BUILDING.

THE FISHERIES EXHIBITS.

PRINTING MACHINERY.

(From the Dundee Weekly News of September 2.)

Mr Watson, Dundee, reports:—Engine 999, built by the New York Central and Hudson River Railway Company, exhibited at the World's Fair in a shed adjoining the Transportation Buildings. This locomotive, which has great attractions for the public visiting the Exhibition, seems a likely enough engine to run at a high rate of speed. It is well finished, and looks very well, but, like the most of the American express engines, the boiler stands very high in the framing. For a few weeks before being sent to the Fair, 999 was run on various trains to test her power and speed. On May 9th she ran the Empire State Express right through from New York to Buffalo, a distance of 440 miles, and ran time. She is said to have run



FASTEST LOCOMOTIVE IN THE WORLD.

69 miles in 68 minutes. On one part of the journey one mile was run in 35 seconds. It seems to be from that one mile she gets the credit of running

102 Miles Per Hour.

The train run on the above date consisted of four cars, and the total weight of the train was 362,000 pounds. Engine 999, as will be seen from the illustration, is an eight-wheeled engine, or four-coupled, with bogie in leading end, standing very high on her wheels, and very plain, although very handsome in appearance. The cylinders are 19 by 24 inches. The valves are Richardson-balanced, and the driving wheels are 86 inches in diameter, the tyres being $3\frac{1}{2}$ inches thick and $5\frac{1}{2}$ inches wide, secured to cast-iron centres by Mansell retaining rings, the total wheel base being 23 feet 11 inches. The engine bogie wheels are 40 inches diameter, with cast-iron spoke centres and tyres, also secured by the Mansell retaining rings. The weight on the four driving wheels loaded is 84,000 pounds, and on engine truck or bogie 40,000 pounds. The boiler is what is termed the waggon-top style, 58 inches diameter at the smallest end, being much wider at the fire-box end, and having

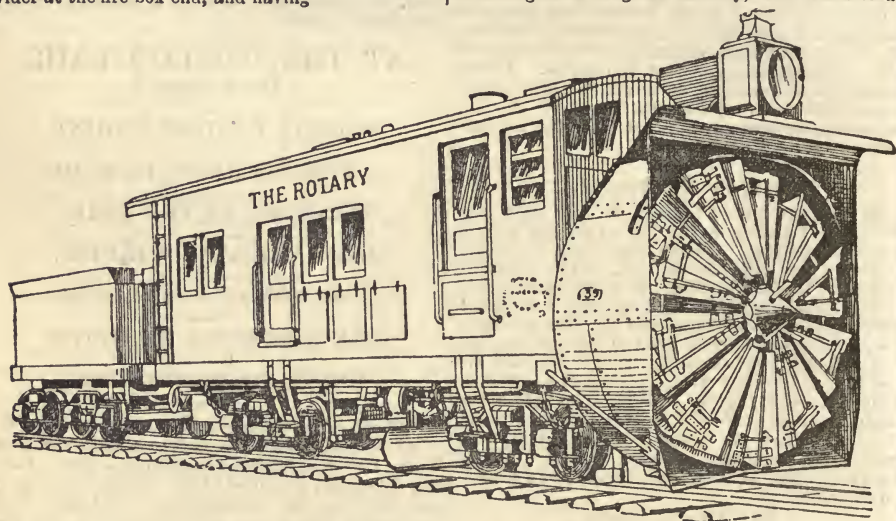
all other American engines, 999 has a very comfortable cab which protects men both from stormy weather and intense sunshine.

British Locomotives.

Amongst other exhibits in the Transportation Hall which are worthy of note is Mr Webb's engine and carriages from the London and North-Western Railway. This engine is a three-cylinder compound, with five driving wheels 7 feet 1 inch diameter. The front pair are driven from the low pressed cylinder, which is 30 inches diameter and 24 inch stroke. The hind pair are driven by the two high pressed cylinders, 15 inch diameter by 24 inch stroke. The carriage which is attached to the engine is also well finished, and everything of the newest invention has been adopted. It is fitted with both Westinghouse and vacuum brakes. Their appearance is attracting the attention of the many visitors, and, I am safe to say, they are likely to be highly awarded in the official judging. A little further round stands

The Great James Toleman.

This engine is a great novelty, and attracts as



THE ROTARY SNOW PLOUGH.

268 Two-Inch Tubes,

twelve feet long. The fire-box is about 9 feet long and 3 feet 4 inches wide, and has the Buchanan water arch. The grate area is 30.7 square feet, and the total heating surface of the boiler is 1,930 square feet, 232.92 of that being in the fire-box. The boiler has an extended smoke-box, and is fitted up with a deflector and perforated steel plate spark arrest. The exhaust nozzles are double, and $3\frac{1}{2}$ inches in diameter. The boiler and fire-box are made of steel pressed at 190 lbs. per square inch. Ajax metal is employed for all bearings, and runs very cold. The tender has room for tons of coal and capacity for 3587 gallons of water, and is fitted with a scup for lifting water when running. The tender rests on two four-wheeled trucks, each with 4 feet 5 inches base and steel tyres. The weight of the tender when loaded is 80,000 pounds, making the total weight of the engine and tender 204,000 pounds. The engine and tender are fitted with the Westinghouse quick action automatic air-brake and signal, fitted with injectors and Nathan sight-feed lubricators. This engine is said to run very smooth, and steams remarkably well. Like

much attention as anything to be seen in the Transportation Buildings. It was designed by Mr Winley, of London, and is intended to run fast, heavy trains. The builders were Messrs Hawthorn, Leslie, & Co., Newcastle-on-Tyne. This is a four driving-wheeled engine, with four-wheeled bogie in front, four high-pressed cylinders—two outside, which drive the pair of trailing wheels, and two inside, which drive the pair of leading driving wheels. The diameter of the driver is 90 inches; size of inside cylinder, 17×22 ; outside, $12\frac{1}{2} \times 24$ inches. The boiler is very large and is oval-shaped, being stayed across the centre, and has 235 2-inch tubes 14 feet $9\frac{1}{2}$ inches long, with very large fire-box. The James Toleman is a very handsome-looking engine and should do good work, although our cousins in America strongly maintain that the Buchanan's large engine will beat him in a race with a heavy train. However, that has to be decided yet.

Other Locomotives.

Other exhibits of note are by the Pittsburgh Locomotive Works. There are a number of very handsome engines exhibited from these works, the

smallest one being a little four-wheeled saddle tank engine for working about the shops. Her track gauge is only 24 inches, and weight 12,500 lbs. The largest one is a six-wheeled coupled engine, with four-wheeled bogie in front. She is 4 feet 9 inch gauge, has 20 x 26 inch cylinder, driving wheels 72 inches diameter, and weighs 139,000 lbs. Another group of engines are exhibited by Roger's Locomotive Company, Paterson, New Jersey. They vary in size and dimensions, and altogether make a very good show. The next thing of importance is

America's Famous Snow Plough,

called the Rotary, for clearing snow from railways. The "plough" consists of a steam engine and driving gear inside of a strong built car run on two four-wheeled bogies. At the front end there is a large wheel fitted with sharp, cone-shaped scoops and automatic reversible knives. This wheel is driven by a shaft from the engine inside, much the same as a boat's propeller, with a tender attached behind to supply water. When the "plough" is pushed against the snow the wheel cuts it and throws it clear of the railway. This style of a "plough" has been in use for some years, and has encountered some of the most severe snowstorms ever experienced. The last one it cleared was in March, 1893, when the snow was 45 feet deep on the rails, accomplishing in six hours and thirty minutes what the officers of the road claimed could not have been accomplished in any other way in less than four or five days. This "plough" was made in the Leslie Brothers Co. shops, Paterson, New Jersey, and is adopted on many different roads in America.

The Fisheries Building.

Mr W. Smith, Denny, reports:—

The Palace of Fisheries is a very picturesque structure, which contains more than three acres of the most interesting exhibits pertaining to live fish and prepared products of the finny tribe. In the east annex is the aquarium, containing thirty tanks of deep sea monsters and aquatic fauna. Herrings are to be seen swimming about, and salmon-hatching in all its different stages is also shown. Almost every country in the world sends samples of fishing boats and the vast variety of appliances used to catch fish, besides pictures of fishing scenes and an infinite number of fish products. Norway is to the front in fisheries. In the exhibit of that country are models of the boats and the weapons used in assailing the walrus, the seal, and the polar bear. Gloucester is strongly represented, a large model of the harbour showing warehouses and the fish docks with all the usual accessories. There is an interesting model of a fishing scene in Boston Bay. The water on which the boats float is well imitated. Down in the depths the nets may be seen, and on the floor of the bay there are the fragments of wrecks, the debris of a roadstead, and marine plants peculiar to the locality. In the same building are models of whales, sharks, devil fish, mammoth lobsters, sword fish, sturgeon, &c. A novel way of advertising a fish glue may here be observed. Two pieces of belting, glued together, suspend an old rusty cannon taken from a British frigate that had been sunk in the St Lawrence nearly two centuries ago. To add interest and variety to this part of the show there are introduced eel traps, lobster pots, and machines which automatically remove the scales from fish. Great Britain sends a fine display of hooks and every variety of angling tackle, but in regard to angling it must be admitted that the appliances shown by America for novelty and ingenuity are far ahead of all other competitors.

TEXTILE FABRICS.

Mr Mungo Smith, Dundee, reports:—On entering the Machinery Hall, be sure I was looking for looms, and almost by instinct I heard the clicking a good way off. Going forward and looking over the railing, I spoke to one of the men in charge, who opened the gate and asked me to go in. There were ten looms in operation, two working cloth for men's clothes. I asked the attendant if it was all worsted, and he said yes. "How much wages could you earn with that yarn?" I asked. "I could make nearly \$3 (12s) a day, but we don't have it so good at home," he replied. One of the looms had 26 leaves of a camb and the other 18. Four were working gingham, and the woman in charge of them came from Glasgow. She told me she liked to work in the old country best, though she made bigger wages here—from \$11 to \$12 (£2 4s to £2 8s) a week, holding on four looms. The remainder of the looms were working bright dress stuff. Further along I watched the weaving of silks in beautiful designs, and there were several exhibits in which silk badges, with

Pictures of Columbus,

President or Mrs Cleveland, as souvenirs were made; also figured silk handkerchiefs and other fabrics. Schaum & Uhlinger, of Philadelphia, occupy a large space in which they weave these and other souvenirs and also weave silk cloth in a design and at the same time put over the ground-work figure another figure which gives the work an effect of hand embroidery. Another interesting exhibit was that of the Star and Crescent Mills, of Philadelphia, by which Turkish towelling is made in various sizes, and young women operatives tie the knots in the fringes with surprising rapidity. The Willimantic Thread Company occupy a large space with several machines. The thread is received here either in the hank or on bobbins. If in the hank, the thread is wound on bobbins and is re-wound from those bobbins on spools. The spooler is

An Automatic Machine,

which requires only that the spools be fed into a trough, and that the thread be fastened on the spool. The machine automatically takes the spools one at a time from the trough, and, after the thread is fastened, winds until the spool is filled, then catches the thread, drops the spool into a receptacle, then takes up an empty spool, and proceeds as before. Another machine pastes the labels on the ends of the spools, requiring no more attention than that of feeding the spools into a trough. The Lowell Machine Shops, Lowell, Mass., illustrate the processes of weaving cotton cloth, beginning with the bale of cotton and ending with the finished cloth, marked, stamped, and ready for market. The baled cotton is opened, and the cotton run through the several operations, from the picker through the spinning of the yarn, then is transferred to the looms and woven.

The British exhibits looked rather tame beside the other stalls. Mr M'Gregor, Glasgow, showed clan tartan making.

Other Manufactures.

Aberdeen represented the comb trade, Sheffield cutlery, and Birmingham guns. Ireland, with linen, made a good show. English pottery-makers made a grand display. The most interesting exhibit, I think, was in heating and cooking stoves. They looked like ornaments for a drawingroom, as I believe some of them were. They resembled large sideboards or cabinets. Sanitary appliances in great variety, of the newest description, were also shown.

United States Building.

The United States Government Building, reports Mr Smith, had great attractions, and it was the only place that seemed crowded. The exhibit of the War Department is most interesting. By means of dummy figures the costumes of all the officers and privates of the different grades of the service are shown. There are models of the principal Government forts to be seen, and there are displayed figures of every noted Indian that has given the army trouble during the last twenty years. An Arctic scene, in which the Eskimos are shown with the dog-sleds and snow-houses is extremely natural, the dogs and figures being mounted in a manner that nearly approaches life. Besides the figures, the War Department has a complete display of small arms and field ordnance. Papier-mache horses are hooked up to the gun carriages, and the gunners are in their proper places. The Smithsonian Institution has a wonderful exhibition of taxidermy, and the Post Office Department has to show every stamp issued by the Government. Coins and bank notes of every issue are shown by the Government Mint.

The Women's Building.

Mr Mungo Smith, describing this department, says:—This building, appropriately enough designed by a lady, is one of the finest examples of architecture at the World's Fair. Many of the rooms are exquisitely frescoed, all of the work being done by artists of the gentler sex. In this connection the exhibit of the British women is acknowledged on all hands to put all others in the shade. The British exhibits of art comprise six water-colour drawings by the Queen, two oil paintings by Princess Christian, one water-colour by Princess Louise, and one oil painting by Princess Beatrice. In the Gallery of Honour the walls are hung with the art productions of the women of the world—British women being here again foremost—and an attractive feature is the collection of portraits shown by Miss Hellen Blackourn of women who have achieved distinction in different channels of the world's advancement. A table made of historic woods, contributed by the women of Pennsylvania, is also very interesting. The main assembly room is particularly worthy of attention and notice, as it is ornamented by panels of carved wood work, contributed by women from every State in the Union. Other interesting exhibits are the model of a co-operative household built of Colorado marble, also model of ragged school for children whose mothers have to go to work, the children being looked after from eight in the morning to eight at night.

PRINTING AND PRINTING MACHINERY.

Mr Logan, Glasgow, reports:—This department is located in the Palace of Mechanic Arts, and from an artistic and mechanical standpoint is very complete. Two very old printing presses are shown, one of which was made in Boston in 1742. The other old press is of similar type, and is almost identical with the old Benjamin Franklin press which I saw in the Smithsonian Institution while in Washington. This press is believed to be 150 years old, and was in use at the time of the Revolution, and was also used during the Rebellion for printing Confederate money. General Lee's farewell address to his army was printed on this press. Outside of these two ancient models, the other presses exhibited illustrate every variety of press that is in successful operation up to the present time. These include presses for every purpose and of various speeds, from the small press for printing cards or circulars to the

Monster Quadruple Presses

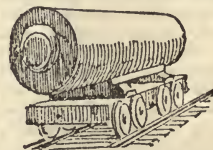
such as in the *Dundee Weekly News* Office, that print newspapers of eight, ten, twelve, or more pages at the rate of about 48,000 an hour. Many of these presses are shown in operation. There is one large lithographic press that prints pictures in colours of the Exposition buildings and grounds. The Chicago evening papers print editions each afternoon in this department. In the stereotyping department no new processes are shown, but complete outfits of different type and manufacture of the generally used processes are exhibited. Type-setting machines of four different styles are also shown in this department in operation. These include both the machines that set ordinary type as well as those that cast the entire line from matrices. The *Daily Columbian*, the official organ of the Exposition, is printed in this department, and the composition is done on one of these type-setting machines. Printing several colours at the same time is also illustrated by several exhibits of presses for this purpose.

Type-Making Illustrated.

The art of type-making is illustrated in a manner that makes it one of the most complete exhibits in this building, as the process of type-making is fully shown by exhibiting machines illustrating the development of this art. This interesting exhibit begins with the old hand moulds, such as were used one hundred years ago, each letter or type being cast in a slow and uncertain manner. The next step in advancement is in the rotary type-casting machine invented in 1840, which was operated by hand. Thirty years later steam power was applied for this purpose, making a machine that seems remarkable even in these days, were it not for the type-perfecting machine of 1893, which is shown alongside the machine of 1870. This latest invention casts type at the rate of 160 to 180 a minute, each type being perfect in every respect and ready for use. It is a machine of marvellous ingenuity. Wooden type, presses, book-binders' machinery, thread and wire stitching machines, cutters, perforating machines, and all other devices used in printing establishments, are likewise shown.

THE FERRIS WHEEL.

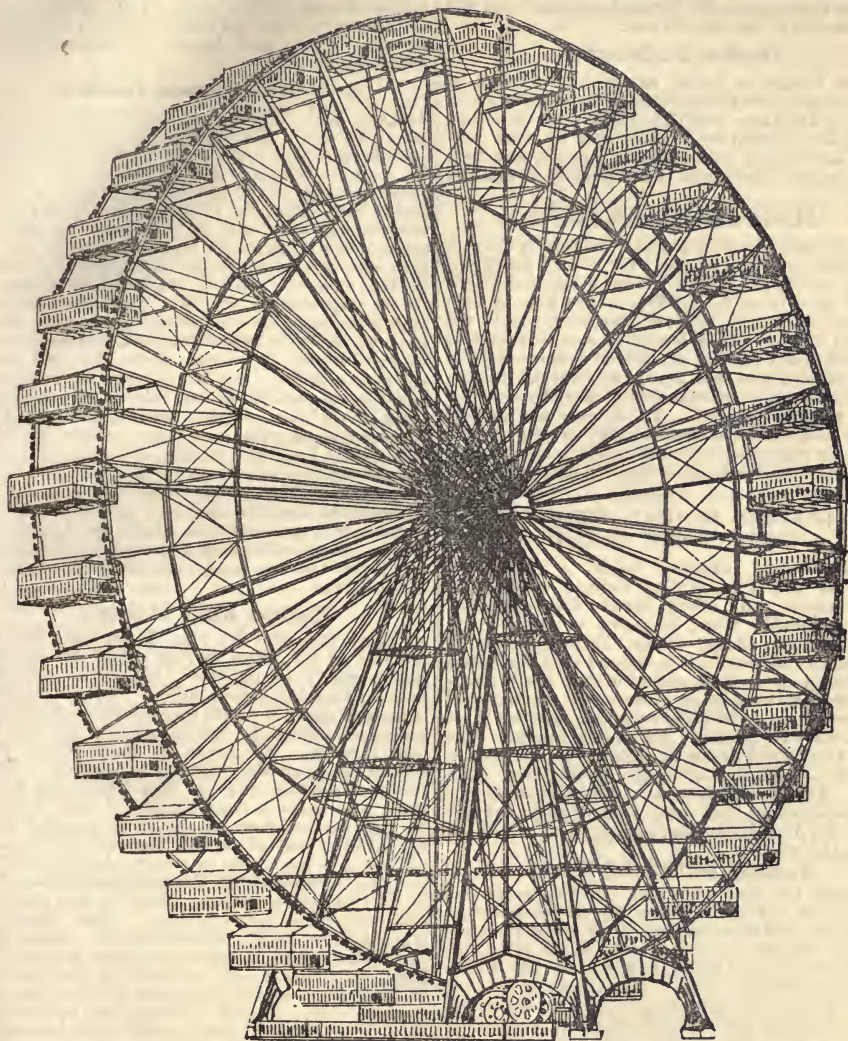
The Ferris Wheel, reports Mr Dunlop, Motherwell, built entirely of steel, is regarded as the greatest triumph of engineering skill at Chicago Exposition. Imagine a monster wheel resembling a huge bicycle wheel revolving between two towers, the wheel being 250 feet in diameter. Around it suspended by great steel trunnion pins are 36 passenger coaches, each as large as a Pullman car, capable of seating fifty persons. Then with its freight of 2000 people it slowly revolves, and the passengers have an unparalleled view of the Fair grounds, a bird's eye view of Chicago and Lake Michigan for miles. A remarkable piece of work in connection with the erection of the wheel was the placing in position of the great axle, seventy tons in weight, one of the largest pieces of steel ever forged. It was placed in its position, 150 feet from the ground, without any accident. The total weight of the structure is 4300 tons. Platforms are located on both sides of the tower, and six cars can be loaded and unloaded simultaneously. Engines of 1000 horse-power



FERRIS WHEEL AXLE.

furnish the means of propulsion, the time for each trip being about 25 minutes. Its total cost was \$400,000 (£80,000). The inventor is G. W. Ferris, Pittsburg, head of a great firm of bridge engineers.

fine show of very well-finished implements. Among them is a threshing machine of a novel kind. It is mostly worked with wooden spring cranks instead of belts. It is a very smart-looking machine, only I think



THE FERRIS WHEEL.

AGRICULTURAL MACHINERY.

Mr Taylor, Raesmill, Arbroath, says:—There is a very large show of agricultural machinery of every kind, and many new inventions that have not as yet been introduced into Britain. The implements are mostly made very light, and generally would not be very well adapted for Scottish farmers. The Carver Header, by Carver Steel Nigg Company, is a novelty, the cutting bar being twelve feet wide. The machine is drawn by four horses. The driver stands upon a raised platform, and works a steering handle. The machine is so constructed that the horses go behind it, much in the same manner as the old Bell Reaper of Scotland, and practically push the machine in front of them. Messrs Massey, Harris, & Co., Brautford, have a

it wants length of shakers. The Platform Binder shown by Mr Davis, Cleveland, Ohio, is a good finished machine. It has strips of cloth for conveying the grain to the binding gear, instead of a solid cloth, which, I think, is an improvement. The strips are three inches apart, and have brass spikes fixed in them for keeping the grain from slipping back. Gaar, Scott, & Co. show a very good set of threshing machinery and traction engines. Their engines are well finished, and are from 6 to 15 horse-power. They also show a self-feeder and band-cutter, a new invention, with a governor to regulate the feeding. The Freeman Manufacturing Company have a splendid show of hay and straw cutting machinery, oilcake, crushers, and pulpers—the last very well finished machines. The Chatta-

nooga Plough Company have a very large show of chilled ploughs, which seem to be all the kind used in America. Some good specimens of old American ploughs are shown. Some 250 years old are shown to illustrate the contrast between them and the ploughs of the present day.

Garden Implements.

The Yankee is before us in the invention of garden tools, everything being of the most improved type. They have small hand machines for sowing all kinds of garden seeds that seem to work very well, distributing the seed more equally, and to a more regular depth than could possibly be done by hand.

Machinery Characteristics.

Mr Brown, Govan, remarks:—In passing through the Machinery Hall of the Exhibition, I could not fail to notice the display from a national standpoint, there being four different countries in competition—Britain, France, Germany, and the United States. It is generally conceded that in point of excellence and as regards beauty of finish the United States will easily outstrip all others, while for actual service and durability Britain's display will rank second. In delicate and artistic finish and embellishment France greatly excels, while for rugged strength and in many new devices Germany is certainly most worthily represented.

THE LEATHER EXHIBIT—THE LARGEST BELT IN THE WORLD.

The leather exhibit holds a prominent place in the Fair. Wax leather, which, it is said, excels all other kinds for durability and serviceable wear, is shown in small quantities by the United States, France, Germany, Japan, and Mexico. It is claimed that the States is second to none here, and also that the Western tanners, who have better processes of tanning, and pay better wages to their workmen, far excel those in the Eastern States. Belting is forward from only Austria and Japan in addition to the States, and the samples are of single, double, and three ply. All are oak tanned. Although small, the Japanese exhibit is of fairly good quality, but here again the Americans claim an easy first. What is said to be the

Largest Belt in the World

is seen in the machinery hall. Of three-ply and waterproof, it is 203 feet long, 8½ feet wide, weighs 5176½ lbs., and is composed of no fewer than 569 hides. The next largest belt, which is in the leather and shoe trades building, is 144 inches wide and 200 feet long. Both these come from New York. No refractory American boy would care to make a close acquaintance with either of these belts. The boys, however, may feel confident that they will not be brought into unpleasant contact with them, as the Americans have not yet produced a man or a machine capable of welding such belts against boys. The Americans again contend for the leading place in sole leather—of which Pennsylvania, California, and Ohio send some particularly fine examples—where their competitors are again France, Germany, and Japan. Some exceptionally well-finished, fancy-coloured enamel and shoe leather is shown by the firm of Halscy & Smyth, of Newark, N.J., and the American Oak Leather Company, of Cincinnati, Ohio, the leather covering of a beautiful pavilion 50 feet by 20 erected by one of these concerns being so finely done as to lead even experts to believe that they were looking upon real oak. France and Germany are about level in the matter of morocco and dongola leathers, small

grains, and fancy goods, the exhibit of the former country, however, being more extensive. The Yankees frankly admit that the morocco made in Philadelphia and Newark, N.J., cannot, so far as appearance at any rate goes, at all compare with the French and German stock. France, Germany, Austria, Russia, and Japan all compete closely with America in the

Section for Harness Leather.

Alligator and kangaroo skins are on view in some numbers. The former are principally used for valises, pocket-books, reticules, and occasionally for shoes. Kangaroo leather is much in evidence at present, but, except for its novelty, it is said that it has nothing else to recommend it, as a good wax calfskin shoe will, it is claimed by skilled carriers, last much longer, and keep its shape better than one made from the skin of a marsupial. One working man was, however, heard to declare stoutly the very opposite in the Fair, his reason for his contention being the strange one that, as a kangaroo was a strong animal, and could jump so far, its skin would, of course, make the best and strongest leather. One of the greatest curiosities in the leather exhibit is the hide of an elephant, which, when green, weighed 800 lbs., and tanned—an operation occupying two years—weighs 500 lbs. It is 20 feet long, 16 feet wide, and 3 inches thick. Several walrus hides, which are used for polishing purposes, are also shown. This industry, more, perhaps than any other, has been revolutionised by labour-saving machinery, in which the Americans excel. Amongst the machines used for currying is an improved belt or band knife-splitter, the knife of which is an

Endless Band of Steel,

which revolves with the edge of the knife close to the side of the rollers through which the leather passes, and is so perfected that it can take off several thin splits from a hide. The lower roller is made of rings, and each ring is capable of springing, so as to allow the unequal parts of the hide to pass through. By means of hand screws the splitter can gauge the thickness of the split. The scouring machine, now in operation in all large shops, also saves a great amount of hard labour. No machine has, however, yet been invented that can take the place of skilled hand work in whitening, which is one of the four particular branches of currying. Nevertheless Yankee ingenuity has produced a whitening machine, which is used successfully on heavy solid leather. This machine is armed with oblique knives, and its cylinder revolves at the rate of 2500 revolutions per minute, making a level, smooth surface on the leather. Previous to the whitening process there is that of stuffing, which consists in filling the leather up with oils and tallow in order that it may be made firm, pliable, and heavy, and by the improved methods adopted in this department, fully 100 per cent. of material can be worked into the leather, whereas by hand it was difficult to work in 50 per cent. On the newer lines hides are tanned in from a half to one-third of the time formerly occupied, but repeatedly during their tour the delegates were informed that the life of American shoes—the term "boots" is given to a description of what we term Wellingtons—was, unless in cases where \$5 (20s) and \$6 (24s) were paid for a pair, of comparatively short duration.

BOOKS AND BOOKBINDING.

It is a somewhat difficult matter getting round the bookbinding exhibit on account of the manner in which it has been "spread-eagled." America and Germany are the only countries which show machinery for the

manufacture of blank books and edition binding, and the exhibit on the whole is disappointing in view of the fact that practically no new principles are seen. The only exceptions in this respect are two paper-ruling machines, one a German, and the other an American invention. Both are self-feeders, and in each the old-fashioned brass pen is discarded for a brass disc. It is apparent that here at least the Yankee, generally well ahead in the matter of ingenuity, has been completely beaten by the phlegmatic but philosophic German, as the Fatherland machine is in several respects superior to the American. It occupies less than half the floor space of its rival; it is stronger, better, and more neatly made, and many of the more important operations are more quickly and more accurately performed. Both machines are also alike in ruling two sides of the paper in one operation, and it is claimed for the German machine that it can turn out

4000 Sheets Per Hour,

with the attendance of only one person. Chicago comes to the front with paper-cutting machines, and New York shows a good embossing and inking press, a clever automatic book-trimmer, and a very rapid-working signature press. Germany and America are well represented by wire-stitching machines, the latter country also having on view a new model of an ingenious machine, which both saws and sews on tape or bands, or without either blank catalogue or edition work. Notable examples of this work are forward from France, Australia, and Canada, and with one exception, where thorough bad taste is manifested, Chicago has also itself a good display. The French exhibit is admittedly first for pure taste and skill. No better collection of printed books has perhaps ever been seen. It is contributed to by America, Mexico, Britain, Germany, France, Italy, Bohemia, Denmark, Norway, and Sweden. The samples of multi-coloured printing on cloth shown by Germany are not only novel and unique, but remarkably striking. Of fine hand-tooled leather binding, the exhibition is magnificent.

Britain's Examples of Art Binding

are solely from the hands of Zaehnsdorf, of London, whose case contains a Tennyson in blue morocco, choicely finished in Derome style, and a beautiful specimen of renaissance work in dark green crushed levant; but the most striking exhibit is the "Art of Bookbinding," in crushed brown levant, illuminated in olive green, with a bold and graceful floral design in gold, and the back panelled with choice foliage. Conspicuous in the German collection is a book belonging to the Emperor William, with his initials and a crown in gold on the side, and bound in brown morocco in the Harleian style. A jewel casket in white morocco, finished and illuminated by Herm Graf & Son, of Altenburg—another very beautiful exhibit—is valued at \$750 (£150). Léon Gruel, of Paris, shows, amongst some other magnificent works, a book bound in brown morocco in the Grolier style, and costing \$1100 (£220). From Rome there are some very fine vellum books, illuminated and finished with great taste and skill, while Bohemia contributes good prayer books in leather and ivory. The books from the Scandinavian countries are striking on account of their beautiful inlaid calf work of Gothic design. The Mexican "show" acts as a foil to the others.

VISIT TO PULLMAN CITY.

THE FAMOUS CAR WORKS.

HISTORY OF THE FIRM.

LIFE IN THE MODEL TOWN.

PUBLIC INSTITUTIONS.

HOW CARS ARE BUILT.

WAGES OF WORKMEN.

THE GREAT CORLISS ENGINE.

A PALACE ON WHEELS.

DESCRIPTION OF CARS.

A CANADIAN PACIFIC TRAIN.

(From the Dundee Weekly News of 9th September.)

Mr Logan, Glasgow, thus describes his impressions:—Among the countless industries and enterprises of the United States there are none which attract more universal attention than the Pullman Car Works and the model city built and owned by them, which forms so delightful a suburb to the city of Chicago. The result of all this



PULLMAN OFFICES, CHICAGO.

gigantic work is due to the inventive genius and power of one man—Mr George Pullman. The idea of constructing a palace car, or one where more comfort could be had in travel than in the very crude cars then in use, was that of Mr Pullman. In the spring of 1859 he left his New York home to seek his fortune in the then "Wild West." Chicago even then promised to become the metropolis of the West, and it was here, with limited capital, he made the first step, which has resulted in such grand achievements by remodelling two passenger coaches into sleeping cars. The public were not prepared for such an innovation, and the