THE GOVERNOR-GENERAL.

A FITTING frontispiece to this number is the portrait which we present of our newly arrived Governor-General, Lord Stanley, who will visit Toronto a few days hence for the purpose of formally opening the Industrial Exhibition. This will be His Excellency's first visit to the Queen City of the West, and the occasion will be one calculated to give him a favorable impression of our industrial as well as our agricultural capabilities. Canada has been singularly fortunate of late years in having as representatives of Her Majesty, men who took a deep interest in the welfare of the Dominion and who assisted not a little in its promotion. We have every confidence that Lord Stanley will prove the equal of his worthy predecessors. We bespeak for him an enthusiastic welcome and a pleasant and profitable visit to the premier province of the Dominion.

[For the MECHANICAL AND MILLING NEWS.

STEAM POWER AS IT IS AND WAS.

By GEO. C. ROBB.

THE power of steam was slightly known many hundreds of years ago, and several steam contrivances are described by Hero, of Alexandria who flourished more than 100 years before Christ.

For 1700 years no progress seems to have been made in the way of bringing steam power into practical use. The earliest steam appliances which proved of any real value were used for discharging water from mines. These were gradually improved, until the pumping engine was produced. In 1769 James Watt patented improvements embodying principles which are still recognized as essential in successful steam engines. Since Watts' time many have been the improvements made, and the questions now raised by some are: Has the steam engine reached its final stage of development? Can it be still further improved, or will it soon have to give place to some simpler and better contrivance for the production and utilization of power?

It will help to find the answers to these questions to look at what has been done already.

The first railway for public travel and using steam locomotives was opened in England in 1829, not yet 60 years ago.

The first successful locomotive was the famous "Rocket." It weighed four and a half tons. The pressure of steam used was 50 lbs. per square inch, and it could draw a load of 40 tons at a speed of a little over 13 miles per hour.

The first American railway was opened in 1832. The locomotive was imported from England, and was a small affair similar in design to the Rocket. It is interesting to note that nearly 30 duty had to be paid to the custom house on it.

At the present day locomotives are in daily use which weigh about 50 tons, and some as high as 70 tons, and the speed attained by the fastest trains is three to four times as great as it was 50 years ago.

The work done by locomotives on the Great Northern railway, of England, in hauling freight will give an idea of the great advance made since the days of the Rocket. These engines haul a gross load of 740 tons in an ascending incline of 1 in 178, with a consumption of 50 lbs. of coal per mile run.

An express passenger train on the London and Northwestern hauls 293 tons at a speed of 45 miles per hour on a level road with a consumption of 26¼ lbs. of coal per mile run. On the Great Northern railway trains are run 105¼ miles without a stop. This distance is gone over in one hour and 58 minutes.

In marine engines greater advance has been made than in any other department of steam engineering. There are obvious reasons for this, as successful voyages can only be made by machinery not likely to break down, and the less fuel used the more paying freight can be carried, and the better the ship will pay.

Attempts at steam-navigation were made as early as 1781, but the first successful steam vessel is said to have been the "Charlotte Dundas" which was used in 1802 as a tug on the Forth and Clyde canal in Scotland. This tug had an engine built by Symington, and was [illegible] wheeler. In 1807 Fulton had a steamer running on the Hudson, and in 1812 Bell built the "Comet," which was the first Clyde steamer, and was driven by two pairs of paddle wheels. The competition for the traffic across the Atlantic has probably done more for the advancement of marine engineering than any other service. The first regular service was established in 1838 between Bristol and New York by the steamer "Great Western"

About 1840 the Cunard line of steamers was established, and to this day this Company's vessels continue to occupy a first place for speed, safety and comfort in making the Atlantic voyage.

In 1857 the American Collins line was established and boats about 260 feet long, and crossing the Atlantic in eleven days were described by an American divine as "magnificent floating palaces, marvels of American skill and engineering, and as lifting the United States into the very front rank among the nations of the earth."

In our own day the great steamers in the Atlantic trade are too numerous to mention, but some particulars of a few of them will show how much the improvement of the steam engine has had to do with the success of the trade.

Dr. Lardner, who some fifty years ago was a great scientific authority, declared and attempted to prove, that steam navigation could never be successfully employed in crossing the Atlantic, as the vessels could not carry coal enough to keep the machinery in motion for the length of time required.

At present some of the slow steamers take in coal enough for a double voyage and carry three to four thousand tons of freight beside passengers.

Of well known Atlantic steamers the "Alaska" has engines of 10,500 h. p. The "Umbria" and "Etrusia" have engines of 14,300 h. p., and the latest addition, the "City of New York," has engines of 20,000 h. p. The great speed at which these vessels run is only obtained by enormous power in the engines, and had there not been great improvements in the economical working of the engines the consumption of coal would have been so great that the vessels would have failed to complete the voyage.

The chief points in which improvements have been made are in making use of the expansion power of steam, and in using a higher velocity of piston.

In the early days of steamboats, the pressure of steam in the boilers was only about 5 pounds per sq. inch. Thirty years ago it had increased to 25 pounds, and in some cases to 40 pounds.

In 187- the average pressure used in nineteen ocean steamers was from 45 pounds to 60 pounds. The coal used was a little over 2 pounds per horse per hour, and the piston speed averaged 375 feet per minute. In 1881 statistics from thirty ocean steamers showed a boiler pressure of nearly 80 pounds, a piston speed of 467 feet per minute, and a coal consumption of 1 83-100 pounds of coal per horse power per hour. At the present date, with triple expansion engines, the working steam pressure is 150 pounds, the piston speed from 750 to 1000 feet per minute, and the consumption of fuel is in some cases below 1½ pounds per horse power per hour. In a steamer using 1,400 horse power and crossing the Atlantic in about 6½ days, the improvements made within the last two or three years makes a saving of about 400 tons of coal per voyage. The use of forced draught at the boilers, the higher piston speed and the larger use of steel, have made a very great change in the gross weight of the engines as compared with the power obtained from them. A few years ago, before triple expansion engines were used, the best engines, including the boilers and the water in them, weighed 480 pounds per horse power. For a 14,000 horse power engine, that would be 3,360 tons as the weight of the steam machinery. In some recent cases the gross weight has been reduced to below 200 pounds per horse power, which for a 14,000 horse power engine would be 1,400 tons, or a saving of 1 960 tons. It is true that the majority of the engines are still made of the heavy design, yet these figures are given to show one direction in which improvements are moving. In some of the smaller war boats the weight of machinery has already been reduced to 136 pounds per horse power, and in torpedo boats to much less.

There is as yet no appearance of any practical substitute for the steam engine. Years ago many thought that the electric engine was in the near future, but marvellous as have been the strides made in the use of electricity, so far from its displacing the steam engine, the demand for electric machinery has produced a special class of steam engines to run the dynamos. For small powers in cities, the gas engine, by which power is obtained by the expansion of gas, has been a successful competitor with the steam engine. The probabilities are that the steam engine will yet be greatly improved, and for years to come will hold its place as the chief motive power in the service of man.

Among the possibilities of the future, one looms out in the distance—an aluminium ship, bright as silver, an aluminium engine driven by the explosion of gas made from the waters of the briny ocean. It floats in an ocean of fuel, and so may drive on as long as provisions last, and the machinery does not break down. No bursting boiler, no dusty coal bunkers, no smoking chimneys, no grimy stokers working in a fiery pandemonium. May we be here to see it!

SAWDUST IN BALES.

WE learn from the *Northwestern Lumberman* that during the past winter an hydraulic baling press for compressing sawdust and lumber mill refuse generally was perfected in the state of Maine on the banks of the Penobscot. The patents are now the property of the Maine Compress Company, of Bangor, Maine, with C. E. Mitchell, the inventor of the press as general manager. Arrangements have been perfected with a Massachusetts concern for the manufacture of the machines.

A description of the machine and its workings is in brief as follows: Erected at the mills is a tramway along which runs on wheels a box-like receptacle or curb, in which the material is pressed. The press weighs two and a half tons, and a floor space 20x30 feet is required. When the work of pressing begins, the sawdust or other material is dropped into the curb, and by means of power, either from a water wheel or engine, a pressure of 125 tons or more is secured.

It is evident that no covering for a bale, unless it be of metal, can withstand such pressure, and just here comes in one of the notable points of the machine. By a peculiar arrangement, a metallic case is so placed inside the curb, and inside the burlap which finally forms the covering to the bale, as to enable the removal of the matter pressed after it has been confined by wire or rope. The curb is so devised as to open at all four corners, allowing the bale to drop to the floor or ground, leaving the curious lining inside. Then by one motion of the levers the curb is again closed, new binding material is inserted and the whole apparatus is ready for a fresh supply.

Two curbs can be used advantageously to one press, and two men can operate a curb. Sawdust is baled at the rate of four bales to the cord. When these bales are dropped they are very compact, weighing about 325 pounds, the weight varying according to the amount of moisture in the wood. The dimensions of the bales are about 24x28x36 inches, and four of them will hold a cord or 128 feet of sawdust. With one press and two curbs from 30 to 40 cords can be pressed daily. Moist sawdust becomes dry in a short time after bailing, and yet the bale remains firm. Still, upon being opened, the sawdust falls apart like meal.

The bale itself is said to be a superior package for shipment, and will be readily taken by the transportation companies at the lowest rate of freight, an average car holding from 20 to 28 cords.

The machine is intended for the compressing of sawdust, shingle hair, refuse wood and bark, and in fact, everything in the shape of waste coming from saw mills, box factories, furniture manufactories and all kinds of wood-working establishments. Refuse from mills, such as bark and sticks, can be baled in the same manner as sawdust, save that no covering is used, it only being necessary to put slate on the top and bottom of the bale. Hemlock bark can now be ground where peeled, pressed into bales, covered with sized cloth to prevent loss of virtue, and then distributed to tanneries through the country at greatly reduced cost. The field of usefulness open to the hydraulic baleing press seems practically limitless. In the line of sawdust alone new uses are steadily being discovered, and it is in ever increasing demand. Presses have been steadily in operation during the past two or three months in the state of Maine, at the mills of Weston & Brainard, Showhegan, and the National Wood Company, Wiscasset.

A correspondent of the London *Electrical Review* gives the following account of experiments in converting light into sound: "In the path of a horizontal beam of light I have a revolving opaque disc with perforations at equal distances apart near its periphery. This disc can be made to revolve at any desired number of revolutions per second, *i. e.*, within the limit of sound vibrations per minute. Behind the perforation is this disc, and in a direct line with the ray of light, I have a microphone enclosed in a glass vessel, in which there is a vacuum. The microphone is of the following construction: resting on a carbon contact is a very thin piece of mica, which hangs almost vertically, and is suspended by an extremely thin piece of metallic foil. The front of this piece of mica is covered with a very thin piece of silver foil, which receives the impulse of the light ray when it strikes upon it, and reflecting that back, also itself recoils backwards, and every time it does so breaks contact with a carbon block it rests against. The other part of the apparatus is a sensitive telephone in the air. A battery is included in the circuit between the microphone and telephone. The electrical circuit is from the battery, through the microphone, through the telephone and to battery again. "The theory of working is as follows: If I revolve the disc so that the beam of light was cut off from the microphone reflector (in the vacuum), say 16 times a second, I should produce 16 vibrations per second in the telephone included in the circuit (in air) and should then produce the deepest limit of sound. And as I increased the speed of the revolving disc, and cut off the ray of light more rapidly, so would the musical note in the telephone get higher."