A. S. LYMAN.

For more than a third of a century the name of Azel Storrs Lyman, who died in Brooklyn, N. Y., Aug. 26, has been a prominent one among American inventors. He was born at Potsdam, N. Y., in 1815, and was of the eighth generation of the descendants of Richard Lyman, who came to New England in 1629. He was educated at the Illinois University, and began the study of the ministry, which he was obliged to relinquish on account of incurable deafness, a physical affliction to which was probably due the fact of his devoting the remainder of his life to the long list of inventions with which his name is connected.

He was one of the first in the field in making fountain pens, having obtained a patent on the holders and nibs in 1848; then came a patent alarm for indicating the want of water in steam boilers, followed by a water gauge; next he had an air engine, on which and on air pumps he made several subsequent improvements. In 1856 he obtained a patent on a method of cooling and ventilating rooms, several subsequent improvements in a similar line in following years being the subject of different patents, one of which was a most simple but ingenious invalid's bed for fever patients; the idea of this was simply to have an ice holder above and back of the head of the bed, from which a passage led to just above the patient's forehead, thus providing for a steady flow of cold air thereon, according to the natural law by which the colder air of a room seeks the lower levels.

In 1857 he began to develop his ideas of an accelerating gun, which was the subject of many succeeding patents, the principles of which have been fully illustrated and described in the SCIENTIFIC AMERICAN; the last of his developments in this chain of ideas seem to have been represented in his three patents on gunnery and an accelerating cartridge, obtained in June last, when the deceased was in his seventy-first year.

The manufacture of paper pulp from wood fiber early claimed his attention, and he obtained a patent on a method of separating the fiber of wood in 1858, which was followed by several subsequent ones for this purpose, as well as for utilizing straw and other fibrous substances, the recovery of spent alkali, and other important details of the paper manufacture. His "fiber gun" was made with long iron cylinders, which might not inaptly be compared with the guns of an army battery; into this prepared cane or wood was put, and kept for a few minutes under a steam pressure of about 200 pounds, after which, by pulling a trigger, a cover was suddenly unfastened, and the contents discharged against a target several feet distant, thus effecting more in fifteen minutes in disintegrating the fiber than was accomplished in many hours' work before.

The many other inventions of Mr. Lyman, which we will not refer to in detail, included a refrigerating car, several methods of preserving meat and vegetables, and for separating gelatine and meat from bones, and rendering lard and tallow, cans for preserving food, and soldering apparatus, apparatus for concentrating milk, a rotary engine, etc. His lines of thought and application were almost exclusively in the field of natural philosophy, the elementary principles of which he was always endeavoring to employ in some new and practical way, to simplify and improve on what had theretofore been done in the various departments to which his attention was directed.

Casting and Forging.

A very general misapprehension exists in regard to the value of cast iron articles and the same description of articles forged from wrought iron. There is a mistaken idea, also, that it is less expensive to cast than to forge. This error is not confined to the unmechanical public, but is shared by many mechanics; perhaps the possibilities and facilities of drop forging are not sufficiently understood; but it is true that many articles can be drop forged from tough wrought iron cheaper than they can be cast from brittle cast iron. The range of purely cast iron work is great—from a single casting of thirty or more tons to pieces that weigh less than a quarter of an ounce—and its cost varies from a price barely above that of the pig iron delivered to sixteen, eighteen, and even twenty cents a pound. But many small articles are cheaper forged than cast, and almost immeasurably superior. The cost and value of the forgings give them a superiority over the castings, especially when one pattern is required in large numbers. For each single casting or plate of castings a new mould is required; moulding costs money and requires judgment if not exact skill, and even with the mechanical appliances for bench moulding the losses from defective castings are very great. But in drop forging the mould—dies—will do for hundreds, thousands, of pieces, and the percentage of loss by imperfection of work is very slight. Nor does plain drop forging require the highest grade of mechanical skill.

There are many small articles of common use in the market—some of them coming under the designation of tools—which, from a mistaken notion of cheap production and low price, are made from cast iron or from cast iron made malleable. Many of these could have been made from wrought iron, or at least from machinery steel, and sold at the same price for as large a profit; or with a few cents added to the price could have been sold at a greater profit. When cast iron thumbscrews with quarter inch shanks are put upon the market the folly of cast iron must have reached its limit.

The Tehuantepec Ship Railway.

Mr. E. L. Corthell, C.E., lately delivered a very interesting address on this subject before the American Association for the Advancement of Science, Ann Arbor, Mich., from which we extract the following:

Assuming it practicable to make the crossing at Tehuantepec, no one will question the assertion that it is much the most advantageous route. Its great commercial advantages are evident from two facts: *First*, it lies nearer the axial line of productions, which may be assumed as passing through Hong Kong, San Francisco, New York, and Liverpool. *Second*, the nautical conditions are much more favorable that at the other locations, calms and baffling winds prevailing on either side of the Isthmus near its southern end, making it almost impossible for sailing vessels to navigate in those waters.

The true scientific method is that one which performs the work of transferring ships from one ocean to the other most promptly and most economically. This method is the *ship railway*.

This method is, in general, to lift the vessel from the water by well known means, and transport it 134 miles over the country, and place it in the opposite ocean by the same means. The details embrace a lifting dock, with a system of the hydraulic rams, so arranged as to hold up and perfectly distribute the weight of the vessel, and a system of carriage supports conforming to the position of the rams and actuated by them, so as to be placed under the hull of the vessel.

The roadbed will be built of the best materials at hand, which the surveys show can be found on the whole length of the railway. The superstructure will be long steel ties, on which will be laid heavy steel rails, weighing about 100 pounds per lineal yard. Powerful locomotives will haul the ships across the Isthmus. The locomotives built recently by the Baldwin Works are sufficiently powerful to do this work. These engines weigh, when ready for service, 102 net tons, and their capacity is 3,600 *gross tons* on a level. Three of these will haul the maximum load of 5,650 tons at 15 miles an hour on grades up to 20 feet to the mile.

The railway follows a succession of broad valleys, so that it is often necessary to make changes of direction to avoid the heavy excavations that would be required by employing the ship railway curves of twenty miles radius. These abrupt changes of direction are made by great floating turntables, which float in segmental basins around a central pivot, though they do not rest on anything but the water, which is pumped into the surrounding basin from the turntable to give it flotation.

The harbors, both on the Gulf and on the Pacific, are excellent and commodious, and the entrances to them can be deepened with small expense.

The large number of practical experts who have carefully examined the plans have given unequivocal testimony to the entire practicability of the method, and also to its economy.

This is not the only ship railway that has been projected. They have been designed for Honduras, Egypt, and Nova Scotia. The time has passed when it is necessary to prove to practical men the feasibility of the ship railway method, therefore the next important subject is taken up more in detail, viz., the *superior economy* of the ship railway over the ship canal, both in construction and operation.

The history of canal and rail transportation, going back to the earliest days of railways, shows how quickly the latter took the lead in every respect, economy as well as dispatch.

Experience and experiments both in this country and England are found in abundance to prove this.

If we compare ship canals and ship railways, we find a greater difference in favor of the latter. The restricted channel in which the ship moves in a canal is the cause of the greater expense required to push the vessel through the water. The boat or ship practically creates a hill up which she is continually climbing; the faster she is urged through the water, the steeper is the hill and the greater is the power required, which increases as the *cube* of the *velocities*.

An historical examination of the actual cost of moving freight by canal and by railroad shows that the latter is far in advance of the former in economy, and if the time lost on the canal is taken into account, there is still a greater difference.

Some of the more important details of the comparison are here given. The constant improvements in railroad transportation have reduced the cost of *hauling* to 6-10 mill per ton per mile.

The load has increased from 20,000 pounds to 60,000 pounds in the last ten years, while the weight of cars has only increased 2,000 pounds. The increase of capacity in cars and power of locomotives, the introduction of steel rails and better system in operation, are the principal causes of the cheap and effective transportation of the present day.

Now, carry out these tendencies to their legitimate extent, as they will be in the ship railway; instead of 15 tons the average, or 30 tons the maximum, moving on *two* rails, put on 1,800 tons, moving on *six* rails, and then, with great concentrated motive power, the freight will be hauled for *two-tenths of a mill* per ton.

Then compare speeds; *two miles* on barge canals is the economical and average speed, *one mile* per hour on ship canals is the customary speed, and not over two miles on the Suez canal.

On railroads it is 15 to 20 miles, and on the ship railway 10 miles. The relative cost of transporting a ton of freight on a canal by steamer and in the free waterway of the ocean is as *six* to *one*. The total cost of *docking* and *hauling* from ocean to ocean on the Ship Railway will be 12 *cents*, but the cost of steaming through the Nicaragua canal will be 60 *cents*.

The immense cost of construction and maintenance of the canals excavated, as the Panama is, below sea level, through a country of excessive rainfall; the long detour required for commerce; the instability of the governments and people through which they pass—these are some of the objections to the canals.

The *strategic* advantages of the ship railway are very important. Mexico and the United States together can protect the railway against any foreign powers. Our navy can hold the approaches to the Gulf; there is a capacious and protected harbor in the Coatzacoalcos on the Gulf and one in Lake Superior on the Pacific, and the railroads leading into Mexico from the United States could quickly concentrate a large army at the Isthmus.

7,000,000 tons of freight are in sight for transportation over the railway in 1889. The railway can be built and equipped in four years' time. $50,000,000 in cash will complete everything ready for business. The estimate in stock and bonds, allowing for all possible contingencies, is $75,000,000.

Even with only 4,000,000 tons, the net profit would be 14½ per cent. The beneficial results cannot be overestimated.

Industry, commerce, society, and religion, in fact in all his relations, will man be benefited.

The success of the projector of the ship railway in his other important works—ironclads during the war, the magnificent bridge at St. Louis, the Mississippi Jetties, and other works, gives standing to this new work, and leads to confidence in the ability of Mr. Eads to carry it through to a successful conclusion.

The address, printed in full, is illustrated by plates of the plans and by maps of the world and the Isthmus.

The Pacific Mills.

The Pacific Mills, situate at Lawrence, Mass., are reported to be the largest textile manufacturing corporation in the world. The capital stock is $2,500,000. The number of the mills and buildings is 23, covering 43 acres of space; there are in use in these mills four large steam engines, of 3,500 horse power; 42 small steam engines; 50 steam boilers; and 11 turbine wheels, of 5,000 horse power. The annual consumption of coal is 25,000 tons; the annual consumption of gas, in 9,000 burners, costs $35,000; the annual consumption of cotton is 15,000 bales; the annual consumption of wool is 4,000,000 pounds, being the product of 750,000 sheep. The annual capacity of the Pacific Mills is, in cottons, printed and dyed, 65,000,000 yards; worsted goods, 35,000,000 yards, or a total of 100,000,000 yards, equal to two and a quarter times the distance round the world. To make this cloth, nearly 200,000,000 miles of yarn are required. To accomplish this work, 3,600 females and 1,900 males, or a total of 5,500 persons, are employed. The pay roll for the year ending May, 1884, amounted to $1,790,000.

The North, Central, and South American Exposition.

Almost simultaneously with the decision to terminate the World's Industrial and Cotton Centennial at the announced time, the 31st of May last, there was formed an entirely new organization under the title of the North, Central, and South American Exposition, which proposes to open another exhibition at New Orleans during the coming fall and winter. Its leading object will be to bring into closer commercial relations the peoples of the three Americas, and, if possible, to divert a larger portion of the rapidly increasing trade with the southern countries to our own ports, instead of letting it pass our doors for the longer journey to European marts. The total imports of Mexico, Central, and South America, and the West Indies, amount annually to $475,000,000, only 16 per cent of which is supplied by the United States. Of the exports of those countries, of about equal value, we receive 36 per cent.

The new organization has purchased the entire buildings and plant of the World's Exposition at a low figure, and therefore starts out under very favorable circumstances. The President, Mr. S. B. McConnico, is supported by a Board of Managers representing all sections of the country. The Exposition opens Nov. 10, 1885, and closes March 31, 1886.