

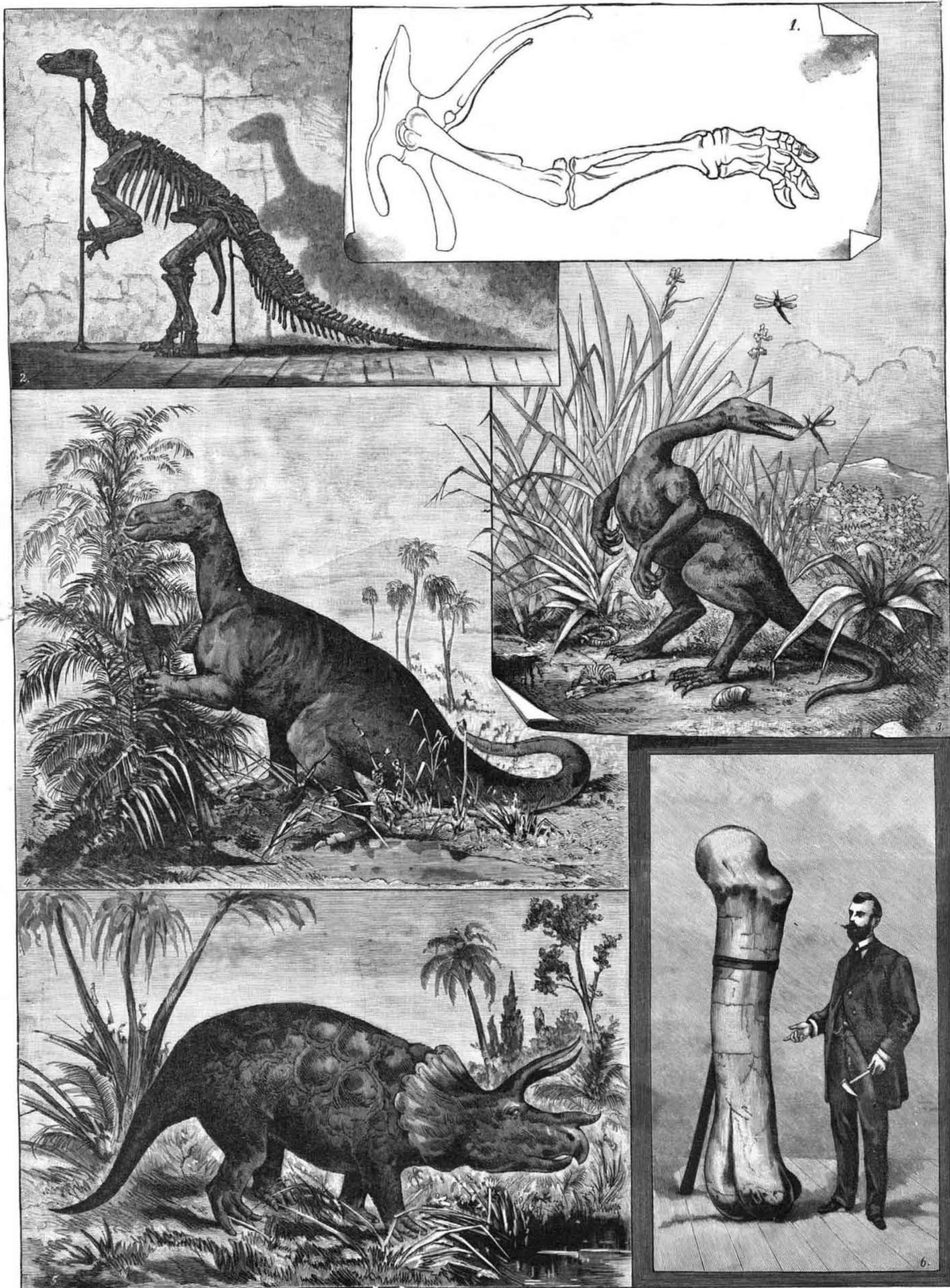
ANTEDILUVIAN MONSTERS.

Fifteen years ago, when the deep cut was being made in the Erlenberge above Kalteuthal, during the construction of the railroad between Stuttgart and Vaihingen, the workmen and engineers were much surprised to strike bones as large as those of a large elephant, embedded in rock, and evidently belonging to some ante-

diluvian inhabitant of the neighborhood of Stuttgart. These fossils were removed with great difficulty, for the old giant whose rest was being disturbed seemed to have set the whole mountain in motion. The pieces of rock were packed in boxes and wagons and carried to the Royal Natural History building, where months were devoted to the work of chiseling the bones out of

the rock, and then putting them together as much as possible. This nearly perfect skeleton is now an ornament to the museum, where its enormous dimensions excite the wonder of visitors.

In order to get a correct idea of the shape of the animal and construction of the skeleton, a great deal of study and comparison with other animals of simi-



1. Pelvis and Hind Foot of the Iguanodon. 2. Complete Petrified Skeleton of an Iguanodon in the Brussels Museum. 3. Compsognathus, a Jumping Dinosaurian of the Jura Period. 4. Iguanodon from the Forest Formation of Belgium. 5. Triceratops, a Horned Dinosaurian from the American Jura. 6. Thigh Bone of the Atlantosaurus (American) that Measured 131 Feet.

DINOSAURIANS OF THE PRIMITIVE AGES.

lar species were required, and but for the information gained from similar fossils dating back to the time between the Jura and the chalk periods and found in Belgium, it would have been very difficult to get a perfect understanding of the "Swabian dragon," or zancloclodon, as scientists named it, on account of the resemblance of the sharp, crooked teeth to a vine dresser's knife. Not less than twenty-one skeletons were excavated near Bernissart, Belgium, some of which were perfect and had petrified in their natural positions, so that they could be set up as complete skeletons as soon as they had been freed from the rock that surrounded them. Fig. 1 shows a hind foot and Fig. 2 a complete skeleton that has been set up in the court of the Brussels Museum, because it is so large that it could not be placed in any of the halls for collections. It belongs to the great iguanodonts, so named from their sharp teeth, similar to those of the living iguana lizard, reptiles measuring about twenty-eight feet, that were quite numerous during that period in north Germany, Belgium, and England. It will not be difficult for even the unscientific observer who stands before the Brussels skeleton to form a comparatively clear idea of the appearance of an iguanodont when alive. It is only necessary to imagine the mass of bones covered with flesh and skin. Fig. 4 shows one of these monsters restored, and we look with wonder and horror at a creature that combines the form of a lizard or saurian with the movements of many mammals. It stood on its hind feet, being supported partly by its great tail, while its fore feet were used for securing nourishment, which consisted mostly of plants. We seek in vain among the members of the early animal world for a creature that approaches our iguanodont in form or size.

But, before considering these monsters and their life more closely, it is necessary to picture the time when they were monarchs of the animal kingdom. We reach back into the darkness of the primitive world, which was in existence long before it was trodden and ruled by man, the period that the laity like best, to call antediluvian. The historian reckons dates of events by the Scriptures and other documents, and the archeologist uses monuments and art treasures to calculate time to within a hundred or a few hundred years; but, in studying the history of the earth in its primitive ages, time is not reckoned by years, hundreds of years, or even thousands of years, but by geological periods, that are not of an absolute, but only of a relative length. The monuments and documents are contained in the earth's crust, of which the strata, corresponding to different periods and piled one upon the other, give us a glimpse of the fauna and flora of those times. The sciences that strive to solve these problems are geology and paleontology, and study of the earth and her animal kingdom.

Geology teaches us that the world is very, very old, older than we men can conceive, that here, as in the great proportions of the heavens, we find everything "endless," beyond the comprehension of man. Geology teaches us further that the time of man is only the last and shortest period in the development of the world, that before the appearance of man, in the tertiary period, mammals of more or less development reigned supreme. As a rule, the farther back we go, the less development we find. Before the tertiary period was the secondary or mesozoic period, while the beginning of life on the earth and the rule of the animal world is called the primary or paleontological period. We now have to do with the mesozoic period of the earth's history, in which we find the first trace of the mammals, and, naturally, we find here also a mass of lower animals. But the reptiles or saurians were monarchs of the animal world, having attained a wealth of species and development with which the reptiles of the present time cannot be compared. Not only have the different species disappeared or changed, but whole orders lived then of which we have no representatives now. I will mention only the well-known fish saurians, to which belong the dolphin-like ichthyosaurs, the long-necked plesiosaurus and the snake-like mosasaurus, and the flying saurian, that dragon-like creature that recalls the bat. The group of saurians represented by our engravings is an entirely extinct species, belonging to the dinosaurs, so named on account of the great size and extraordinary form of these animals. The wildest fancies of the middle ages could scarcely have pictured more dreadful dragons than that we find in this group of animals, some of the members of which are lizards with little heads and long tails, and some have bodies of a more compressed construction, with great skulls more than a yard long, and long legs, and finally there are strange species that stand upright and jump, representing the kangaroo or the jerboa among the saurians.

The oldest dinosaurs that we know of belonged to the triassic formation of the first part of the mesozoic period, and the best are from the marl in which the zancloclodon spoken of above was found near Wurtemberg. It was an immense upright beast of prey, measuring 28 feet in length, its claws and teeth indicating the carnivorous animal.

In the Jura formation that followed discoveries have

been rare in Europe, and do not begin to increase until the end of this period. We will mention only the megalosaurus, which followed the zancloclodon, but was much larger, its upper thigh bone alone measuring 3 feet 3 inches, and its jaw being provided with double-edged teeth. Even more interesting than this giant was an inhabitant of the shores of the Jura Sea, which then spread over the greater part of Germany. We mean the little compsognathus, which is shown as restored in Fig. 3. A complete skeleton of this animal was found in the lithographic stone of Kehlheim, from which we see that it was scarcely 24 inches long, with quite a large head and hind feet adapted for jumping. It is the smallest species of the dinosaurs, and the most nimble in its movements. Of all the creatures that belonged to the epoch following the Jura period, we should mention first the iguanodont. Figs. 1, 2, and 4 show the specimen mentioned above and the creature as restored.

The small number of saurians found in Europe has been greatly surpassed by the more recent discoveries in America. Along the Rocky Mountains there is a girdle of limestone which belongs to the Jura and earlier chalk formations, and here the unnumbered specimens of dinosaurs have been found which are the pride of the American museums, especially the museum in New Haven. It would take too much space to touch even lightly upon the features of the species that have been discovered in America, and of which whole skeletons have often been found, so that the beast could be reconstructed with certainty, as the iguanodont had been reproduced. Here we can mention only two kinds that are shown in our illustration: first, the atlantosaurus, the great giant of the dinosaurs, the upper thigh bone of which is 6 feet 6 inches long and 24 inches thick at the upper end. It is hardly possible to conceive such a "moving mountain," for it is estimated that this monster was 131 feet long and 22 feet high. These dimensions are much greater than those of any other known animal. The largest whale that was ever measured was only 98 feet long, and the largest beast that lives on land, the elephant, only 22 feet to 26 feet (from tip of trunk to tip of tail). The atlantosaurus lived on plants. It had a remarkably small head, long neck, and a long body that rested on long, strong legs and a long, powerful tail.

The species shown in Fig. 5, the triceratops horridus, was also very large, measuring 59 feet to 65 feet. It is of a very peculiar type, resembling the rhinoceros, this resemblance being due especially to the monstrous skull, which is about 6 feet 6 inches long and has three horns, one on the nose and two on the forehead; behind these horns is a strong shield with spikes that protects the neck, and the body was also protected with bony spikes and plates, which increased the terrible impression made by the beast.

But enough of these terrible animals for to-day, and let us rejoice that the time when the earth trembled under their heavy tread is passed, and still more in the steady progress of science, which enables us to throw more and more light on the primitive ages of the world and to again bring to the daylight the uncanny reptiles that gave their stamp to those times.—Dr. Eberhard Fraas, in the *Illustrirte Welt*.

Tropical Roofs.

The natives of the interior of Ceylon finish walls and roofs with a paste of slaked lime gluten and alum, which glazes and is so durable that specimens three centuries old are now to be seen. On the Malabar coast the flat bamboo roofs are covered with a mixture of cow-dung, straw, and clay. This is a poor conductor of heat, and not only withstands the heavy rains to a remarkable degree, but keeps the huts cool in hot weather. In Sumatra the native women braid a coarse cloth of palm leaves for the edge and top of the roofs. Many of the old Buddhist temples in India and Ceylon had roofs made out of cut stone blocks, hewed timber, and split bamboo poles. Uneven planks, cut from old and dead palm trees—seldom from living young trees—are much used in the Celebes and Philippines. Sharks' skins form the roofs of fishermen in the Andaman Islands. The Malays of Malacca, Sumatra, and Java have a roofing of attaps, pieces of palm leaf wicker work, about three feet by two in size and an inch thick, which are laid like shingles and are practically waterproof. The Arabs of the East Indies make a durable roof paint of slaked lime, blood, and cement. Europeans sometimes use old sails—made proof against water, mould, and insects by paraffine and corrosive sublimate—for temporary roofs.

Cement for Steam Pipes.

Another cement of specially valuable properties for steam pipes, in filling up small leaks, such as a blow hole in a casting, without the necessity of removing the injured piece, has been compounded. The cement in question is composed of 5 pounds Paris white, 5 pounds yellow ochre, 10 pounds litharge, 5 pounds red lead, and 4 pounds black oxide manganese, these various materials being mixed with great thoroughness, a small quantity of asbestos and boiled oil being afterward added. The composition, as thus prepared, will

set hard in from two to five hours, and possesses the advantage of not being subject to expansion and contraction to such an extent as to cause leakage afterward, and its efficiency in places difficult of access is of special importance.

An Interview with Jacquard nearly a Century Ago.

The Jacquard machine, as is well known, permits the weaving of the most complicated patterns, enabling manufacturers of textile fabrics to produce the most tasteful and elegant goods at a price within reach of all classes. This most ingenious machine was the invention of Jacquard. Long years ago, we paid the old man a visit, and he welcomed us with heartiness. "But," said he, "come forth into my vineyard; let us get among the grapes and sunshine." So he led the way with tottering steps, and, sitting down by his side, I told him I was an Englishman, and, as he was a most ingenious man, I had come to see him. "Well, I am proud of a visit from an Englishman. If I have done any real good, I owe the first suggestion to England. It was an English newspaper that led me to occupy my thoughts with mechanical improvements, and, but for that, it is probable I should still have been a poor straw hat maker in some obscure street in Lyons. It was during the peace of Amiens that a translated extract from an English newspaper met my eye offering a premium, by some society in London, to any one who could apply machinery for the production of nets. After many attempts, I made a machine which produced a perfect net and, somehow, thought no more about it. The net I carried about with me in my pocket, and one day the question was put to me by a friend what would I do with my machine. I gave him the net as my answer. Time went on, and I was surprised at receiving an order from the prefect to see him as soon as possible. I went: he produced my net and said, 'I have orders from the Emperor to send your machine to Paris.' 'From the Emperor! That's strange! You see it is all in pieces and I must have time to put it together again.' Very soon I managed the affair, and trudged off with it and a half-made net to the prefect. I bade him count the number of loops and then strike the bar with his foot, when another loop was added to the number. Great was his delight—and the interview ended by the words, 'You shall hear more about this than you are aware of just now,' and I did, in a way that perplexed me not a little. The prefect sent for me and said, 'You must go to Paris, M. Jacquard, by his Majesty's orders.' 'To Paris, sir! How the deuce can I? What have I done?' 'Not only must you go to Paris, but to-day, immediately.' 'Well, then,' I answered, 'I will go home, see my wife, pack some clothing, and—' 'You will not go home, there is a carriage now waiting to take you; my orders are imperative to send you on at once; I will provide you with money and all you require.' I jumped into the carriage and away, full gallop, to cover the 150 leagues to Paris. At the first station, I opened the door to step out, but was stopped by a gendarme. 'Sir, if you please, you are not to go out of my sight.' I found myself a prisoner. On we went, and for the first time in my life, I found myself in Paris, and strange, indeed, was my introduction there. Having been taken direct to Napoleon and Carnot, the latter said to me suddenly, 'Are you the man that can do what Omnipotence cannot? Can you tie a knot on a string on the stretch?' I was confounded, and could not answer. The Emperor said, 'Don't be bashful, my man, speak up. I will protect you.' In answer I said, 'Give me materials and some place as a workshop and I will try what can be done.' At the time a superb shawl was to be woven for the Empress Josephine, and for its production they were constructing a very costly and complicated loom, upon which the sum of twenty thousand francs had already been expended. I recollected having seen a model by Vaucanson, in which was a principle I thought might be made to serve a purpose I had in my mind, and, after intense application, I produced the machine bearing my name. The Emperor conferred this decoration upon me which you see upon my breast, and a pension of one thousand crowns. But, on my return to Lyons, I was received by an infuriated mob of weavers, who declared that I had doomed them and their families to starvation. Three plots were laid to assassinate me, and twice, with difficulty, I escaped with my life, and so strong was the prejudice against me, that my machines were openly destroyed by order of the public authorities in the great square of the city. The iron was sold for scrap, the wood for fire lighting. Trade declined, owing to the successful competition of foreigners, and, as a last resource, I was begged, entreated, and continually supplicated, to make another experiment. I succeeded; silks of greater beauty were produced at a lower cost; the dawn of prosperity set in and continued to shine. I have lived to see thousands made. It has given labor to tens of thousands, and I thank God who gave me the intellect and preserved my life to be a public benefactor."