

680,000 millions. Each bee, before flying homeward, visits 50 flowers, therefore the whole assemblage has visited 3,400,000 millions of flowers. If out of the ten only one flower has become fertilized, 340,000 millions of fertilized would be the result.

Supposing the reward for the fertilization of 5,000 flowers to be one German pfennig, the united bees of Saxony have obtained per annum a sum of 68 million pfennigs = 680,000 marks (\$170,000). Each hive represents in this way a value of ten dollars.

#### PHILANDER HIGLEY ROOTS.

Another of the pioneers in American invention and mechanical industry, Mr. P. H. Roots, of Connersville, Ind. has come to the end of a long and useful life. Mr. Roots was born in Rutland, Vermont, Nov. 17, 1813. In his fifth year his parents removed to Oxford, Ohio. His mechanical genius developed early. While still in college he experimented with rotary engines, achieving notable results for the facilities for construction at his command. About the same time he developed a plan for raising water by means of the condensation of steam, the apparatus, though imperfectly made, proving quite a success.

After completing his college course, at Miami University, Mr. Roots went into business of woolen manufacturing, with his father and two elder brothers. The crude and imperfect machinery in use at that time was very unsatisfactory to him, and much of his time was spent in constructing appliances of various kinds to save labor and do more perfectly the work that at that time was done almost entirely by hand. Many of these devices were entirely successful, and were in constant use until the woolen mill of which he was part owner was burned in 1875. Probably all of them were patentable. He early made a model for a power loom, having a positive motion for throwing the shuttle derived from the motion of the lathe itself. Several years after he invented a cam motion of a peculiar kind for working the harness of power looms. The arrangement was such that it could be easily changed to weave any regular fabric, with any number of leaves, each of which had a positive motion, and was entirely independent of the others. The plan was afterwards patented by other parties, and is in successful use in nearly all the mills in the country. He also invented a Jacquard arrangement for fancy cassimere looms, which was successfully used for many years, and probably was inferior only to the Crompton loom in point of workmanship.

He also constructed a warping mill for woolen goods, in many respects superior in its general adaptation to all kinds of work, warping, sizing, and drying perfectly in one operation. Many other devices might be mentioned, for they were, his brother says, all through the mill, and no machine was accepted as being perfect, even from the best manufactories, unless it could do all he thought it ought to do in the best manner.

Between 1856 and 1860, in connection with his brother F. M. Roots, he developed and perfected the rotary blower, so widely known throughout the mechanical world. Mr. Roots, however, was not an inventor only. His knowledge of every department of the woolen manufacture, in which he was so long engaged, was uncommonly extensive. He was also a great reader, and was widely respected for varied and extensive information. In his family and social relations Mr. Roots was greatly beloved and respected. He died Sunday, May 18, 1879.

#### Steam on Third Avenue.

A trial of the Angamar steam motor was made on the Third Avenue surface road, June 2. During the day several trips were made from Sixty-fifth street to Printing-house Square, in connection with one of the large open cars. The conductor said the motor could have drawn two or three cars if necessary. As it passed up and down during the busy hours of the day it attracted a great deal of attention, and caused no little fright to some spirited horses. On several occasions ladies wishing to take a car of the Third Avenue line declined, with a dubious shake of the head, the conductor's invitation to get on board. Others however, showed no hesitation. The engineer managed the starting and stopping on signals from the conductors of the motor and the attached car with apparent ease and promptness. The motor resembles an ordinary street car in shape, but it is higher and larger. The driving machinery is under the floor. On the front platform are the small furnace and boiler. Here also the engineer sits with his hand on the lever. Hot water is pumped into the boiler at the depot, and little fire is needed to keep it at the steam generating point.

The president of the railroad company said that the company had determined to adopt some substitute for horses as soon as a satisfactory one could be found.

#### Centrifugal Force and Fly Wheels.

It is not always that practical men are willing to admit the value and importance of scientific knowledge as regulating the operations and accidents of a workshop. We had a valuable incident of the kind that forced itself upon our notice, says a foreign contemporary, a few days back. A large pulley or rigger, 3 feet in diameter, and very wide, was split across its rim by carelessness in unloading; at the same time it was noticed that two of the arms out of six were cracked by contraction in cooling. In order, however, to save expense it was proposed to patch the broken rim of the pulley

with wrought iron plates, which was done. "Per se" the iron plates were stronger than the original casting, but the whole weight of the patch amounted to about 15 lbs. As the pulley revolved at the rate of six hundred revolutions a minute, this unbalanced weight on the rim became by calculation as much as 7½ cwt. radial force outwards. This scientific result was brought to the knowledge of the practical men, but they could not see why the pulley would not do very well if the patch was as strong as the rest of the rim. The pulley was accordingly run under protest, and hardly had the maximum speed been attained before the pulley flew in pieces, and might have been dangerous to life and limb. The pulley, undoubtedly, broke, as above indicated, by centrifugal force, which, by the unbalanced patch of 15 lbs., caused a breaking radial pressure outward upon the broken rim at the position of the patch of 7½ cwt. This was quite sufficient to break the rim outward with enormous force, so that the pieces flew about the shop like fragments of a bursting shell. It will be well for machinists to remember this incident when they have occasion to repair fly-wheels.

#### Natural Enemies of the Electric Telegraph.

There is, apparently, no apparatus so liable to be interfered with by what we may call natural causes as the electric telegraph. Last week we saw what perils from vermin and fungus environ the subterranean wires. Fish gnaw and mollusks overweight and break the submarine conductors; while there is at least one instance of a frolicsome whale entangling himself in a deep sea cable, to its utter disorganization. It is stated that within the three years ending 1878, there have been sixty serious interruptions to telegraphic communication, in Sumatra, by elephants. In one instance, these sagacious animals, most likely fearing snares, destroyed a considerable portion of the line, hiding away the wires and insulators in a cane brake. Monkeys of all tribes and sizes, too, in that favored island, use the poles and wires as gymnasia, occasionally breaking them and carrying off the insulators; while the numerous tigers, bears, and buffaloes on the track render the watching and repair of the line a duty of great danger. In Australia, where there are no wild animals to injure the wires, which are carried great distances overland, they are said to be frequently cut down by the scarcely less wild aborigines, who manufacture from them rings, armlets, and other varieties of barbaric ornament. It has been suggested as a means of protection in this case, that the posts should be constructed of iron, when the battery could be used to astonish any native climbing them with felonious intent.

#### Governor's Island for the World's Fair.

The latest site proposed for the World's Fair of 1883 is Governor's Island. The island lies in New York Harbor, about half a mile south of the southern extremity of the city, and is about a mile in circumference. The proposer says:

"Here would be 'room and verge enough,' and to spare; and in the requirements it surpasses in many particulars all other suggested sites. Access to the island could be had by steamboats by means of a pier which should extend several hundred feet from, say, the north shore. Specially constructed and arranged ferryboats could ply to the island, connecting with New York at its lower part, and higher up on the North and East Rivers, and also with Brooklyn, Jersey City, etc. The pier would also afford facilities for excursions to the Exhibition by steamers from the principal river and seacoast cities and towns of the New England, Middle, and Southern States. This direct water communication would largely contribute to the success of the Fair by affording quick and non-fatiguing, as well as cheap means of travel from and to distant sections of the country. In addition there might be a bridge of boats across Buttermilk Channel connecting the island with the shore of Brooklyn."

The great objection to this site would seem to be the circumstance that the island is a fortified post of the United States, and not likely to be surrendered for the purposes intended. Besides, it would furnish no proper site for the permanent buildings to be erected by the city and State.

#### A Fatally Polluted Stream.

A distressing case of wholesale poisoning, through criminal ignorance or worse, has just occurred in a country school, in Vermont. The school opened Monday, May 26, and as usual the children got their water from a little brook that ran close by. The teacher noticed the bad taste of the water and forbade its use; but the caution came too late or was neglected, and in a little while seventeen of the children were prostrated with alarming illness, ten or twelve dying within a day or two, the bodies of the dead corrupting so rapidly that immediate burial was necessary. Investigation showed that a farmer had polluted the stream by the carcasses of a horse and several sheep, and the drainage of his barnyard. A medical investigation resulted in a report that diphtheria was the cause of the terrible mortality, aggravated by poisoned water. Diphtheria in a mild form had been in the vicinity, and four cases were known to exist, so that water poisoned by barnyard drainage and putrid carcasses of dead animals was just the thing to feed the disease into the development of the terrible disaster. One would think that the putrid carcasses would sufficiently account for the fatal pollution of the water.

#### Prejevalsky's Expedition to Lhassa.

If no mishap has befallen the Russian explorer, Colonel Prejevalsky, he is now pushing across the great sandy desert traversing the western center of the Chinese Empire, somewhere in the neighborhood of Suchau. His intention is to proceed across the marshy Tsaidam district to the Tibetan plateau; then, after joining the usual caravan route from Koko Nor to Lhassa, he will proceed as far as the latter city, which is the great object of the present expedition, and if possible make an excursion into the unknown country to the southeast, where Tibet abuts on the extreme eastern Himalayas. He proposes to return partially by the same route, but eventually to deviate toward Khotan and Kashgar. The entire journey is estimated to last two years. The expedition is fully equipped with money, firearms, and ammunition, and meteorological and astronomical instruments.

#### Eight Minutes Under Water.

A boy seven years of age was seen to fall from a bulkhead into the Hudson River, June 2. After considerable delay a youth named Thomas Berry came to the rescue, and the spot where the boy sank was pointed out to him. By a plucky dive and a long swim under water he succeeded in recovering the boy, who had been in the water eight minutes, and was apparently lifeless. A successful effort was made to resuscitate him, signs of returning consciousness appearing at the end of twenty minutes. The officers of the patrol of the water front pronounced this the most remarkable case of resuscitation after long submergence that had come within their knowledge, and it was put upon record as such. The happy issue should encourage hope and persistent effort in all similar cases.

#### The Forster-Firmin Amalgamator Co.

In the SCIENTIFIC AMERICAN of November 2, 1878, the Forster-Firmin system of amalgamating the precious metals was described and illustrated. The first annual report of the officers of the company controlling the system indicates a promising future for it. Machines are now building for use in Arizona and Idaho, and arrangements are being completed for their introduction in Colorado and California. It will be remembered that by this process the mercury is atomized by steam, compressed air, or other equivalent medium, and forced through a stream of pulverized ore. By this means, in connection with their system of washing and settling, the inventors claim to obtain all the precious metal in the ore, and also to recover nearly if not quite all the mercury used; the economy of the process being such as to make the system profitable with poor ores.

#### THE ISTHMUS CANAL.

The International Canal Congress came to a decision May 28, adopting by a vote of twenty-nine to sixteen the Wyse Panama canal without locks. This project, it will be remembered, contemplates a canal, substantially along the route of the Panama Railway, nearly 45 miles long, with a tunnel 3¼ miles in length. To this project the President of the Congress, M. de Lesseps, was committed from the start, and it was through the influence of its projector that the Congress was called. The local influence brought to bear in its favor was irresistible, the result showing a splendid victory of social over civil engineering. M. de Lesseps immediately began the formation of a company to carry out the project, announcing that a first subscription of 400,000,000 francs will be opened simultaneously all over the world about September next. It is to be an essentially popular loan, without government aid or guarantee. The amount of the first subscription, of which 10 per cent is to be paid on subscribing, will, M. de Lesseps expects, be more than covered. Mr. Nathan Appleton will be a director of the company, and will be delegated to open subscriptions in the United States.

It is also announced that M. de Lesseps intends to proceed to Panama, by way of New York, to take out the first spadeful of earth on the 1st of January, 1880. The intention is to have the canal open for commerce before the year 1900; a result we reckon to be contingent on clever financial engineering rather than on social or civil engineering, great as may be the problems thrown upon the resources of the last.

#### American Society of Civil Engineers.

The eleventh annual convention of the American Society of Civil Engineers will be held at Cleveland, Ohio, beginning Tuesday, June 17. From the list of topics to be considered and the names of those expected to contribute papers and take part in the discussion, it is safe to predict an enjoyable and profitable meeting. During the meeting the Society will visit Pittsburg to inspect the government works for the improvement of the river at that place.

#### James Orton Woodruff.

Those who were interested in the Woodruff Scientific Expedition will be pained to hear that its projector died at his residence in this city, June 4, of brain disease, brought on by the care, anxiety, and overwork connected with his great enterprise, which was temporarily abandoned May 8. Mr. Woodruff had just developed a new plan, which had been accepted by Prof. Clarke and others interested, when inflammation at the base of the brain terminated his life.