THE NEW SCHOOL OF MECHANICAL ENGINEERING AT HOBOKEN, N. J.

The most recent and, as it promises, one of the most complete of American schools of mechanical engineering, is that about opening in our neighboring city of Hoboken, N. J., the "Stevens Institute of Technology."

This noble institution was founded by a provision in the will of the late Edwin A. Stevens, who, as well as his brothers, John and Robert A., and father, Colonel John Stevens, before them, was well known to many of our readers as an able and successful engineer.

The bequest referred to provided that a lot of unoccupied land, in the finest part of the city of Hoboken, should be set apart from the Stevens estate for the purpose of erecting upon it "an institution of learning," and the sum of one hundred and fifty thousand dollars was appropriated for the building. Another sum of five hundred thousand dollars was set apart as an endowment, the income from which is expected to cover the running expenses of the school.

In accordance with these provisions, Mrs. Stevens and Messrs. Shippen and Dod, the trustees, have erected a fine building, of which our engraving gives an excellent representation, and which it was determined should be adapted for a school of mechanical engineering, in recognition of the evident necessities of the times, as well as with a view to the special appropriateness of such a disposition of funds furnished by a great engineer.

THE STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J.

The building is now completed, a Faculty chosen, and an announcement is just formally issued. The Faculty are: as President, Professor Henry Morton, the brilliant lecturer on physical science, and former editor of the *Journal of the Franklin Institute.* As Professor of Physics, Dr. A. M. Mayer, formerly of Lehigh University, and well known among scientists by his valuable original researches in magnetism and other branches of physics. As Professor of Mechanical Engineering, we find the name of R. H. Thurston, late of the U.S. Naval Engineers, and a member of the Academic staff of the United States Naval Academy. Professor Thurston was formerly from Providence, R. I., where, under the eye of his father, then senior member of the well known firm of Thurston, Gardner & Co., steam engine builders, he obtained his practical workshop and office training. He was educated at Brown University, taking the course in engineering; and at the breaking out of the rebellion, entered the United States navy as an engineer officer, serving ten years, and meeting with every variety of practical work, as well as recently doing duty as "Lecturer on Natural and Experimental Philosophy" at the Naval Academy.

Prof. Albert R. Leeds, the Chemist of the Institute, was lecturer at the Franklin Institute of the State of Pennsylvania, at Philadelphia, and is a rising man.

Col. Hascall comes from West Point to take the department of mathematics; and we judge that the others of the Faculty are equally chosen.

These gentlemen are now engaged in collecting apparatus and a library, and fitting up their several departments preparatory to the opening of the college, September 20th, next.

The *curriculum* begins with an extended course in mathematics, including the applications of the calculus, a course in chemistry, and the usual college course in physics, and also courses in French and German. Having thus laid a foundation, the superstructure is erected. This consists of an advanced course of qualitative and quantitative chemical analysis in the laboratories, a course of practical work in the physical laboratory, and the course in mechanical engineering; in other words, the course of applied science. The course of instruction in the physical laboratory is one seldom offered by our colleges, but is of especial importance to the mechanical engineer. It places in the hands of the student the barometer, the manometer, the densitometer, the balance, and the vernier, and every other instrument of physical investigation, and teaches him their use by actual practice,

Drs. Morton and Mayer have collected a splendid set of apparatus for this department; the optical collection—including the whole of the celebrated "Bancker collection" of Philadelphia—is the most complete in the world, and contains many instruments of great historical as well as practical interest.

For the mechanical department, large orders have been given, and others are in course of preparation.

In this collection are to be selections from the catalogues of Schötter, of Darmstadt, and Schöder, of Frankfort, as well as heavy drafts upon Salleron, of Paris. There may be found here the engine and boilers of a steamboat used by Colonel John Stevens, on the Hudson, sixty-seven years ago, the boiler being tubular, and equal in design to many of the "safety" tubular boilers of the present day, and the screws —*twin* screws—of as good form as many now running; here are models complete and incomplete, large and small, of the great, and once wonderful, Stevens iron clad battery, which still lies—modernized by General McClellan and Engineer I. Newton—in the same spot in which the keel was first laid.

Here is a most beautiful model of the oscillating engine and feathering paddle wheels, as built by the well known English firm of Penn & Son; here are pumps and engines, rotary and reciprocating, boiler models of all styles; and we are promised so much that is interesting that we hardly know where to stop cataloguing them.

In the workrooms and machine shop, where the student is taught the principles involved in tool using and in the trades auxiliary to engineering—pattern making, molding, and founding, nd amachinists' work—is to be placed a small collection of carefully selected tools and machines.

Already a drill, by the Putnam Machine Co., and one of Browne & Sharpe's beautiful "universal milling machines" are in; and, in selecting other tools, the difficulty will probably be to determine which of our manufacturers shall be allowed to place their tools there, where they will be so continually on exhibition.

A course of instruction in drawing, under the direction of Professor McCord, accompaniesand illustrates, and its earlier work precedes, the course in engineering, extending through the whole four years, and in all of the courses of instruction we are promised that great care will be taken to make each branch assist the others, and, in all, to give special attention to all principles having a directly practical bearing upon the student's professional work.

It seems to be the intention of those having charge of the institution, to go about the business of preparing young mechanical engineers for their profession in a thorough and business like manner, and we wish them the full success that they are evidently determined to command.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Motive Power of Ammonia.

To the Editor of the Scientific American:

In your valuable journal of July 29, 1871, page 70, there there appears an article headed "Ammonia as a Motor," in which you describe the principle of the ammonia engine so clearly that I would not have troubled you with any remarks, had it not been for the following:

"The report of the examining committee, headed by General Beauregard, approves of the invention in terms which are too indefinite to be conclusive."

As one of the committee, I wish to be understood as indorsing liquid ammonia as a motor just as capable of running an engine as the liquid water, because heat applied to liquids expands them into steam or gas if not opposed by pressure. Water at 212° is confined by the pressure of the atmosphere 14·7 pounds in the square inch. So is ammonia equal to 14·7 pounds at 40° below zero, which is its boiling point. But if we add 120° to water and raise its temperature to 332°, it is held as liquid at a pressure of 100 pounds to the square inch; and I know from having examined the gage in connection with the ammoniacal boiler while running, that the pressure was over 100 pounds when the temperature of the atmosphere was at 80°. If we add 40° below to 80° above zero, it is just 120°, so that the power or pressure in ammonia has been got up at the same expenditure of heat—namely 120°—as the water. But if the water be allowed to expand into steam, and the temperature kept up to 332°, in an engine of the proper size in accordance with the heating surface in the boiler, the pressure will be constant, and never above 100 pounds on the square inch. It is exactly so with liquid ammonia. At 80° it exerts a pressure of over 100 pounds upon the square inch, and this force has been got up by 120° of heat.

When the heating surface is equal to the demand, the pressure is kept up so long as any of the liquid remains; and this heat is furnished by the atmosphere, which can never rise above 120°; hence the pressure cannot exceed 180 pounds upon the square inch. To this extent only can liquid ammonia be used as a motor without the application of fire; and wherever fire cannot be applied to raise steam, I consider ammonia the best and cheapest substitute for steam, especially when I consider that a man can carry a bottle of this liquid in his pocket that will run a sewing machine constantly for a week, or, at the option of the operator, it may last for a year if used only occasionally, and will always be ready to do its work.

Hence my opinion is not indefinite but definite, that liquefied ammoniacal gas as a practical motor is just as much a fixed fact as steam is. JOHN ROY.

No. 60 Camp street, New Orleans, La.

Plumbago in Virginia.

To the Editor of the Scientific American:

We desire, through your columns, to give to the public a short account of a remarkable deposit of plumbago, recently discovered near this city. This deposit is about 400 yards from the James River canal, a few miles below Lynchburgh. Though only a partial and very superficial examination has yet been made, the mine is found to extend over an area of one mile in length, and a quarter of a mile in breadth. It appears on the surface in parallel strata, of from one to two feet in breadth. The shallow diggings which have been made into it, show a rapid increase in the width of the veins, and improvement in the quality of the mineral below the surface. These veins, most probably, unite at no great depth, and form an immense mass of this valuable substance. Specimens taken from the surface show this plumbago to be of fine merchantable quality, and the quantity is believed to be almost inexhaustible. It is, indeed, the most extraordinary deposit of plumbago yet discovered. Being entirely free from rock, it may be mined with little expense, and its proximity to the canal affords the cheapest transportation to the northern cities. The multiplied uses and increasing demand for plumbago make this discovery of great importance to the manufacturing interests of the country. We send you a few small specimens of the mineral from different veins, as taken from the mine near the surfaec.

A. F. ROBERTSON & CO.

Lynchburgh, Va.

Rolling Bodies.

To the Editor of the Scientific American:

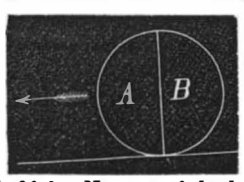
In the SCIENTIFIC AMERICAN of July 22, page 69, is the following editorial answer of L. C. to E. W.:

"All things else being equal, two wheels of different weights, will roll down the same plane, in equal times. No matter how the weight is distributed, provided the wheels are balanced, and not taking into account the resistance of the air."

I think the question of E. W. looked beyond the generally known fact, that all bodies, without regard to difference of weight (other things equal), would descend by gravity in equal times, and whether the theory found in standard works were true, namely, that with two wheels similar in all respects, excepting in the distribution of the weight being respectively near the center, or circumference, that the latter would be a longer time in descending the plane than the wheel with the weight near the center? If we use the equivalent of an inclined plane, in the form of a circular arc, on which the wheel should roll, or vibrate, the difference in time (if any) could be easily detected—and we are presented with this difficulty on the supposed trial on the arc of a circle: What becomes of the retarding force of the circumference weight, when arrived at the bottom? It is now accelerative, and a greater distance on the ascent is inevitable, with the extraordinary result of a weight raising itself to a point, higher than its original position, and so continually gaining in hight at each vibration. Make a pendulum of a large disk (no rod) suspended at the edge, having the weight around, to contrast with a similar disk, excepting the weight being near the center.

By the alleged error in the books, the starting, stopping, and reversal of the partial rotations of the outer weight, should cause slower vibrations than with the centrally weighted disk. But their vibrations would be in equal times.

I digress from the immediate question, to note the mistake of engineers, in ascribing a loss of power by the reciprocating motions of a heavy lever beam, or other weight. There is no loss (apart from friction) when attached to a crank, which is thereby equally and alternately aided and retarded.



Let the figure represent a wheel or cylinder on a horizontal plane. Bisect vertically—then no part of the half, *a*, can move in the direction of the arrow, without decrease of velocity in that direction, and therefore becomes accelerative to the half, *b*. No part of the half, *b*, can move in the direction of the arrow without increase of velocity in that direction, and is therefore retardive to the half, *a*. These counteracting forces are always equal, on all planes, inclined or horizontal,

and will also start, or stop the wheel without regard to the distribution of the weight. THOS. W. BAKEWELL.

Pittsburgh, August, 1871.

Paine's Electro-Motor.

"A little knowledge is a very dangerous thing."

To the Editor of the Scientific American:

Had Mr. Smith possessed a *little* more knowledge of the subject he has been discussing adversely to myself, I should not now be under the disagreeable necessity of placing him in a very ridiculous position. In order to meet his case understandingly I shall give you, as far as I am permi ted, the true status of the motor under consideration.

Two years since, and at the end of twenty-eight years of almost constant study and experiment, I succeeded in removing the last obstacle to what was deemed the successful utilization of electricity as a motive force. The subject was laid before capitalists, who in their turn submitted it to electrical scientists. The result was that it was decided to raise funds for the purpose of experimental research and construction, and also the securing of patents at home and abroad. The first step taken was the construction of the present motor, which was built by the Messrs. Seymour and Whitlock of this city. As is usual in such cases, there was great impatience and great haste, and the engine was first set up on the ground floor of my back office *without its intended bed plate.* This bed plate is Mr. Smith's "shell, without a pin hole through which one may look." The engine more than realized the expectations, and its results getting noised about, I was soon compelled to remove it to the top floor of a building in the rear of the office, in order to get rid of the crowd of sight seers. On this top floor the engine was in operation three months without this "shell with not a pin hole, etc. etc.," and not until it became necessary in the course of my experiments to obtain an exact measurement of the power developed and cost of the same was the engine placed on its "shell." I might rest my case at this point, for the *animus* of Mr. Smith's whole article is to suggest fraudulent practices on my part, and that this "shell" concealed the whole, or in part, fraudulent mechanism.

The spread of the bed plate gave the engine firmer bearing on the floor; that was all the duty it performed. When the dynamometer brake was applied, when off the bed plate, the narrow base of the engine allowed the weights to cant the engine.

The tests of the duty of the engine were made by experts selected by the monied men of those interested. They brought their own batteries and dynamometers; they did their own weighing of the power and waste of zinc. On one occasion, the engine was started at 10.30 A.M., and moved without cessation till 4.30 P.M., under a break load of 66,000 foot pounds with a battery of four 8 inch Bunsen cells, and under the inspection of a committee of two, one of which constantly timed and watched the engine. And when it is added that the engine has repeatedly been stopped, taken off its bed place, and then again made to do its duty, how absurd do all Mr. Smith's quibbles about "eccentricity" of Mr. Paine's engine, and the "variegated statements of Mr. Paine" appear!

Now there are some scientific bummers so obtuse as to be excused for conceiving the possibility of a belt brought up through the "shell" from some auxiliary power, but there is no excuse whatever for the merest tyro when he attempts to account for certain results by suggesting a concealed battery. Mr. Smith having seen the engine knows that there is not more than six hundred feet of wire (No. 15) in circuit, and knowing this, he knows that if the whole building in which the engine stands was filled with a concealed, or otherwise, battery, it could not be of any auxiliary benefit in the production of the power he witnessed.

Ten Bunsen cells on that circuit will raise the temperature of the coils to 150 in ten minutes, and 20 cells set the commutator in a blaze in an instant.

Now, as regards the statement about the construction of an engine outside of my shop, I have to say, that a party interested, avowedly for the purpose of assisting me in my labors, proposed to construct an engine, but the proposal was emphatically rejected by the controling board of our company, upon the just theory, that as we were not constructing engines, but were prosecuting a long series of experiments to obtain *data,* and were also making applications for patents on new features, developing themselves daily, it would be inexpedient and hazardous to have the details of the invention, even as far as we were then advanced, scattered around in different shops. The wisdom of this determination is already evident, and must impress every candid person, when it is known that since that period we have taken another European patent, and two American patents, and have filed two caveats. But the party referred to did, secretly, without my knowledge or consent, proceed to construct an engine, which, in confidence to a friend, he avowed would be a great improvement on Paine's. I knew nothing whatever of the matter till after this improvement was proven a failure, and then, when I was approached to help them out of *their* difficulty, indignantly refused to have anything to do with it. As I am also entirely ignorant, at this date of writing, about the three other engines, Mr. Smith makes mention of, so of course it is impossible for me to have made any of the statements I am alleged to have made in connection therewith; it is simply a question of veracity, which I do not believe even Mr. Smith has the temerity to press to an issue.

With reference to Mr. Smith's last paragraph, I reply, that I have never asserted that my motor "was a perfect success." I have stated, and verified that statement, that I have succeeded in obtaining a duty of 66,000 foot pounds for twelve hours with four 8 inch Bunsen cells consuming three ounces of zinc.

The *obtaining* of such a result, and the *ability* to put it into such a shape that the Smiths and Rowlands could comprehend and operate it, are two different things.

And now I demand, by what right am I, an inoffensive experimentor, devoting the best years of my life to the realization of results that must inure to the great benefit of mankind, put on my defence as a criminal? Thank God, I do not live in Galileo's day, when the malevolence generated of chagrin and beaten skill could bring me to my knees or the rack.

Newark, N. J. H. M. PAINE.

Extracting Gold from Washings and Poor Ores.

To the Editor of the Scientific American:

Your impression of July 1, contains an article with the above caption, which, if found practicable, will be of the utmost importance to the mining interest on this coast. Our export, from San Francisco, in 1868, of the precious metals, was $48,864,924. We are aware of a loss, as per fire assay, of 35 per cent by the present processes of amalgamation. The production of the Comstock ledge alone in 1867 was in round numbers $15,000,000, showing a loss under fire assay of $8,000,000. There are reservoirs of tailings, some containing as high as 500,000 tuns, awaiting just such a process as you describe. It is not more mines we need; it is an improved process for the treatment of the ores got from those already being worked; and there is no more promising field for discovery to your scientific readers than that of studying the treatment of these ores.

The minute subdivision of quicksilver, applicable in a dry state through the aid of a vehicle which will relinquish its hold of the mercury, when it comes in contact with the precious metals, is what we want. Many methods have been tried to effect this object; such as volatilizing the quicksilver and then condensing it, or by electricity, the dry ore being put into a wooden tub lined with copper, and, a solution of salt and sulphate of copper being added, the positive pole of a powerful battery is connected with the copper lining of the pan; and the revolving arms or mullers inside the pan being covered with copper, the negative pole is connected therewith, when a partial subdivision of the quicksilver takes place. Also by mixing zinc with the quicksilver to give it a barb like form so that it would the more readily catch the precious metals, and many more methods have been tried, but all practically failures.

I hope you will follow out your enquiries regarding this Australian process until the particulars are before your readers.

Baker Co., Oregon. JAS. DUNCAN.

Safety Valves of Steam Boilers.

To the Editor of the Scientific American:

Seeing in the papers the statement of Inspector Matthews in the Westfield case, that he never knew of a safety valve not working unless arrested by the engineer, I have been prompted to write you a little of my own experience.

When a boy, I was running a small stationary engine for Mr. Benjamin Brown, of Portland, Maine. The safety valve got stuck one day, and while we were at dinner, the steam accumulated till there was sufficient force to open the valve. When it did so, the whole building was filled with steam, which made a tremendous noise in its efforts to escape, equaling that of two Sound steamers when blowing off steam. Everything around and near the boiler was covered with a thin coating of mud thrown from the boiler. There was plenty of water in the boiler, as was ascertained afterward. No damage was done to anything.

The probable cause was that for some time there had not been steam enough carried to open the valve; and as I did not understand that it was necessary to occasionally lift it, a coating of lime or some other substance had cemented it fast. In all probability, if the boiler had not been new and strong enough to sustain sufficient pressure to force open the valve, we should have had an explosion, which people would have tried to account for by low water or defect in the boiler.

Undoubtedly many boilers have been exploded by this cause, therefore I think great attention should be paid to this subject.

Farmington, Minn. J. H. THURSTON.

Railroad Cars.

To the Editor of the Scientific American:

I beg leave to suggest an improvement in railway carriages, by which weight and cost would be diminished, and greater security insured. It is simply to frame the body of the car sides, ends and roof, of iron rods—in a word, to construct a cage. This might be covered with leather; *papier maché,* or even wood, might be introduced to any extent indicated by convenience or taste. In case of any kind of accident, the danger to passengers would be less from the bending of iron rods than from the breaking up of wood; and injury to cars would often be easily repaired at a comparatively small cost. P. G. S.

Baltimore, Md.

Photographic Concentrated Iron Developer.

To the Editor of the Scientific American.

I see by your issue of July 22, that Mr. Edwards finds considerable benefit by using sulphate of copper in his iron developer. It is now five years since I experimented with copper, and with favorable results, although laboring under the disadvantage of winter lights in England. I did not find it hasten the action of the developer, but it enabled me to keep the solution on the plate long enough to bring out the finest detail in the shadows, without destroying the delicate half tones of the parts that were fully exposed to the light, being especially useful in the case of white or fancy dresses. I used a larger proportion of copper than is given in Mr. Edward's formula. From a stock bottle of a saturated solution of protosulphate of iron, I took sufficient to reduce to a 15 grain solution, adding 1 oz. of alcohol and 1 oz. of acetic acid (glacial), to every 18 oz. In another bottle I kept a 15 grain solution of sulphate of copper, with the same amount of alcohol and acid, which I added to the iron (just before using), in quantities varying from 25 per cent to an equal amount, according to circumstances.

Oshawa, Ontario, August, 1871. JAMES S. HEATH.

Electro-Motors.

To the Editor of the Scientific American:

Mr. Paine does well to distinctly state [SCIENTIFIC AMERICAN, August 12], that a magnet specified by him "will acquire a lifting power of fifty pounds in the 120th of a second." All I have to say to this is, that experiments which I made last winter with a magnet of nearly the construction he describes, fully justify me in declining to accept his statement.

Mr. Paine objects to my experiments in a telegraph office on account of long circuits. It happens, however, that the third and fourth experiments are wholly on a very short circuit, and with very small magnets. If the relay magnet, with the manipulating key, be also put on a short circuit (and it can be easily done), this magnet will behave precisely the same in respect to time as when on a long circuit. What objection now to these experiments?

But what can Mr. Paine mean by saying that I have not the knowledge required to produce a model of his motor, unless I have had access to the secret archives of the Patent Office? I made all the electrical connections and tests of the model which he acknowledged to be correct, and I have also seen his English patent. Does he mean to deny the correctness of these now, or is his object to publicly repudiate his own explanations, made in his shop last winter?

J. E. SMITH.

Easton, Pa.

A CORRECTION.—A whole line seems to be omitted in my article on page 101. It should read, "He did, however, send a substitute with information that the magnets must be made of a certain size or they would not work; but the certain size given, that required by the English patent (which was held to be a correct guide) and that of the magnets in the Newark engine, were all at variance with one another." I mean that the manufacturers had three contradictory sizes to be guided by, coupled with the assurance that the magnets would not work unless made just so and so! J. E. S.

Breakage of Watch Case Springs.

To the Editor of the Scientific American:

The breakage of the case spring is one of the most frequent failures which occur in hunting case watches, and is as disagreeable to the owner as to the repairer of the watch. The former has to pay a considerable amount, and the latter gets only a small profit by this repair, because he is very often obliged to put several springs in the watch before one will stand. To obviate this inconvenience, I tried to make the springs of brass instead of steel, and found that, if well hammered, this metal suits perfectly to the purpose. After this, I made all case springs in the following manner: I take a piece of brass wire, a quarter of an inch thick and two inches long, and bend an eighth of an inch, in the vise, to a right angle; then I hammer it alternately on four sides, till it gets a sparkling appearance. This is the sign of the right temper. Then I bring it to the same shape as a steel spring, and make it fit in the case.

I will add, that I never saw a spring that was made in this way become weak or broken; and watch makers who will try this method will find that a brass spring is made in half the time that a steel spring is, beside saving of files and other tools. T. M.

Homestead, Iowa.

Sleep Walkers.

To the Editor of the Scientific American:

My observation has led me to believe that sleep walking is a habit of the system.

I have noticed that children who are allowed to go to sleep on the floor or lounge, in the evening, and afterwards, at some regular hour, are aroused (of course only partially awakened) and sent to bed, will in time acquire the habit of sleep walking. I have no doubt but that the man mentioned in the SCIENTIFIC AMERICAN of July 22d., who would get up and go to the cellar in the night for a drink of wine while asleep, had been in the habit of first going for it, in the night time, while awake. I presume but few have failed to notice how soon the mind, by dreams, will recognize a habit of waking at a particular hour for any purpose.

I think that the whole philosophy of sleep walking has its foundation in habit, acquired by disturbance at some regular hour devoted to sleep. E. H. R.

Bloomington, Ill.

THE COTTON STATES MECHANICS' AND AGRICULTURAL FAIR ASSOCIATION announces its second grand annual fair, to be held at Augusta, Ga., on October 31, November 1, 2, 3 and 4, 1871. We have received a list of the premiums to be awarded, which are very numerous and valuable, and are offered for successful practice in all branches of agriculture, mechanics, textile manufactures, domestic economy, etc. The pursuits in which competition is invited are selected with unusual care and judgment, and cover the whole ground of the useful arts and sciences. Mr. W. H. Tutt, of Augusta, is the President of the Association, and Mr. E. H. Gray, the Secretary.