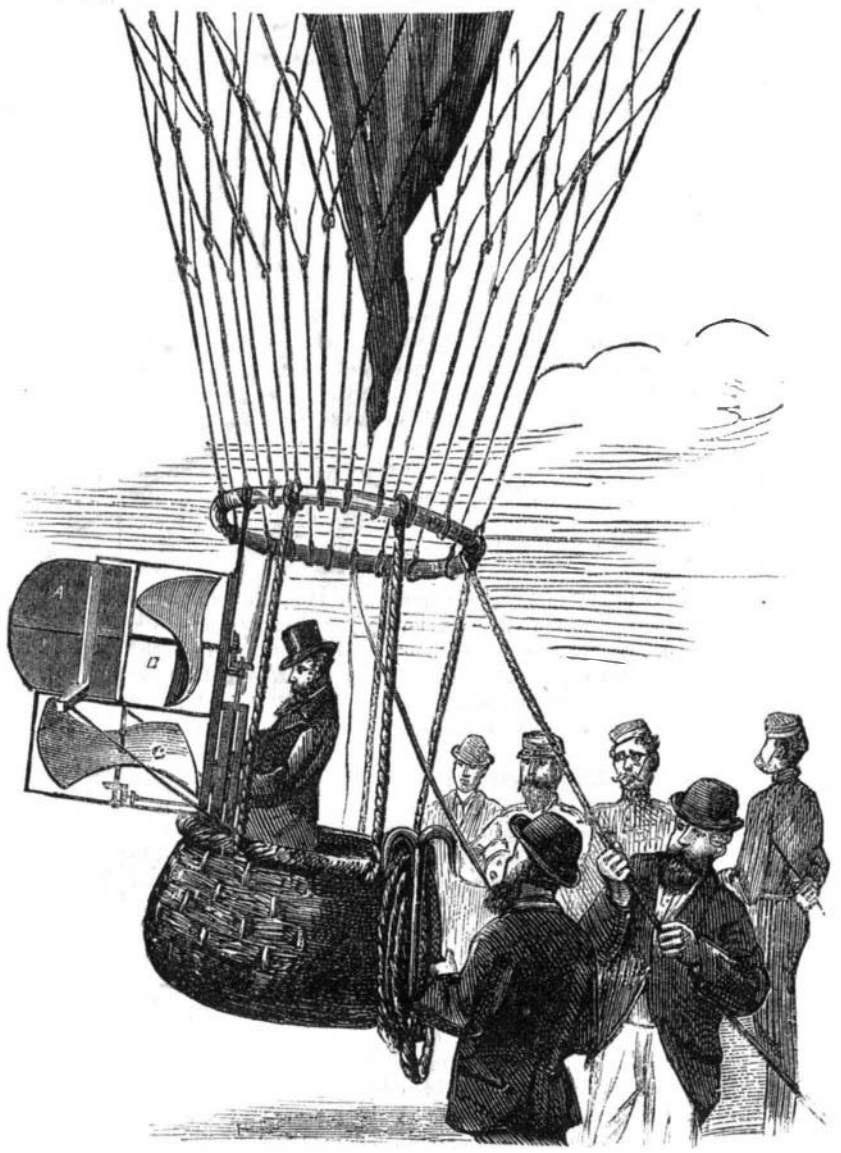
A BALLOON STEERING DEVICE.

Experiments have recently been made, at Woolwich Arsenal, England, with an invention designed to accomplish the long wished result of steering a balloon. It is the invention of Mr. Bowdler. and consists of two fans or propellers, and a rudder with simple hand gear, the entire apparatus weighing about 70 lbs. In our Fig. 1, C is a sheet iron propeller working on a vertical axis, and made to rotate by multiplying gear and winch at from 600 to 720 revolutions per minute, the object being to cause the balloon to ascend or descend without loss of gas or ballast. B is a similar propeller working on a horizontal axis at about the same speed, inasmuch as this may be required to act in any direction. A rudder, A, made of canvas, with strengthening bands, is fixed opposite the propeller, and is held in any desired position by ordinary rudder lines, while the propeller is made to revolve by hand and winch. This gear Mr. Bowdler did not consider was large enough to suit the balloon which the well known aeronaut, Mr. Coxwell, lent for the experiment, and which contained about 60,000 cubic feet of gas. He hoped, however, that a distinct indication of the effect of the propellers would be manifest.

The experiment was carried out under the personal direction and orders of Major Beaumont, R. E. The official programme was as follows: (1) The balloon to be balanced carefully, and when in a captive condition to be raised to about 150 feet, and lowered repeatedly by the vertical propeller in order to test its efficiency. (2) The balloon to be released, and as soon as the course be shown to be steady and the direction ascertained by means of Mr. Coxwell's indicator, maps, etc., the horizontal propeller to be worked at right angles to the course of the balloon, and its maximum effect thus obtained carefully noted. (3) The balloon then to be raised and lowered by the vertical propeller, without throwing out ballast or discharging gas. After attaching the gear to the side—as shown in the engraving—Major Beaumont, Mr. Coxwell, Mr. Bowdler, and a sergeant of the Royal Engineers entered the car and the first part of the programme was commenced, a series of small pilot balloons being sent off in succession to ascertain the direction of the wind and probable course of the balloon when liberated.

The balloon was fairly balanced and the vertical propeller worked, and the balloon raised to a hight of about 40 feet, and lowered again. (See Fig. 2.) The vertical propeller, when worked hard, produced a decided effect; probably the maximum rate of ascent did not exceed 50 feet per minute, but it was not far short of it. The was no great accuracy, speaking critically, in the arrangement of the conditions. For example, the line which held the balloon captive was held by hand, and thus every foot the balloon rose it had an additional foot of line to carry. This would tell on a hight of 40 feet, although the line was slight; and had the 150 feet laid down in the programme been adhered to, the effect would have been very considerable. A mean rate of ascent and descent might correct the error. After a few trials, however, the gear broke, and the vertical propeller became for the time disabled. Shortly after this the balloon was liberated for the trial of the horizontal propeller, and the remainder of the programme was visible only to those in the balloon.



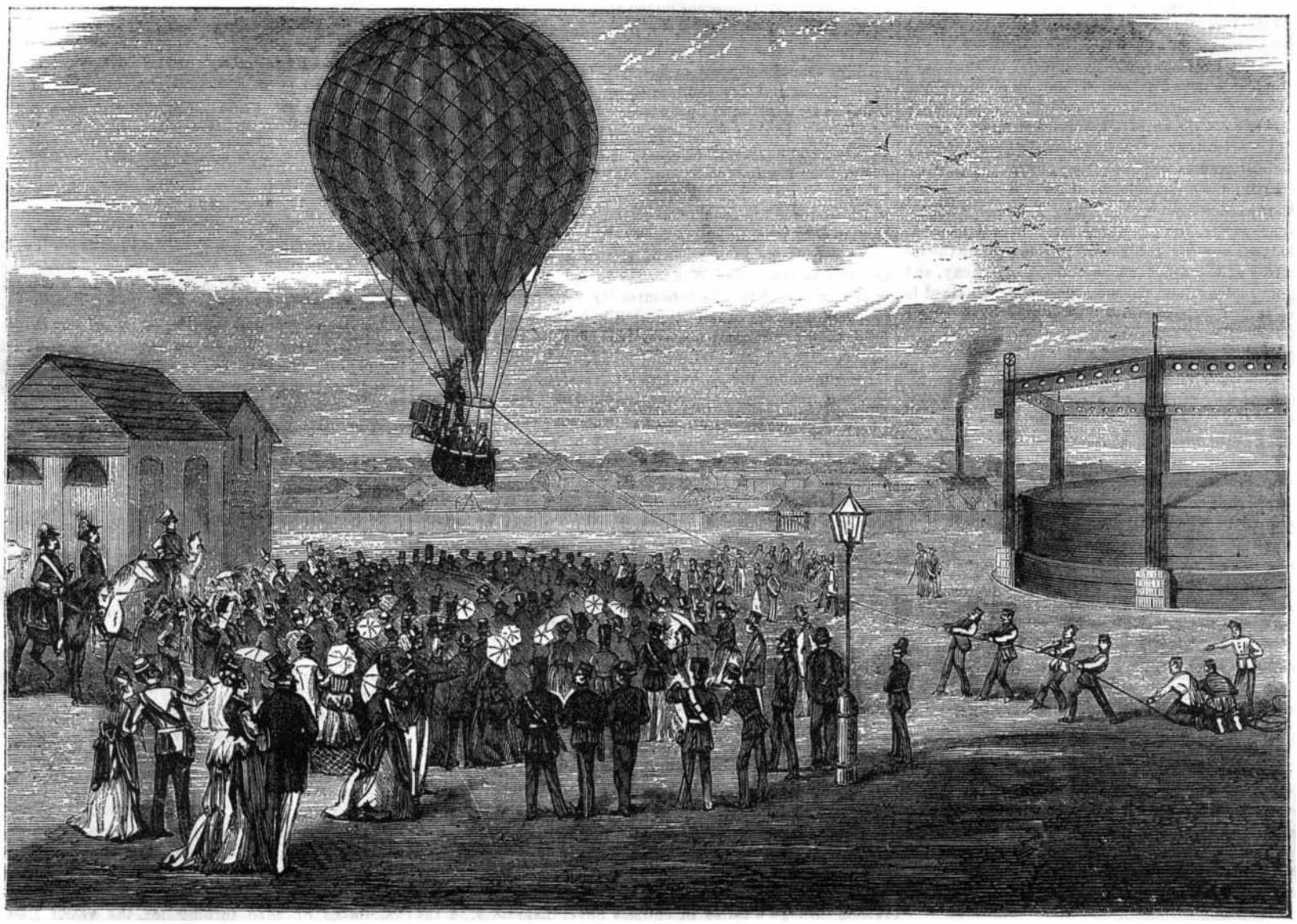
BOWDLER'S BALLOON STEERING APPARATUS.—Fig. 1.

Mr. Bowdler considered that his steering apparatus ought to be shown to have had an effect. This it had, but in the nature of things it could hardly be otherwise. The question is whether it gave promise of producing a sufficient effect to be useful, and this we cannot at present say it did.

The problem of how to develope sufficient power to alter and govern the course of a balloon is, says *The Engineer*, from which we extract the engravings, no easy one. The enormous bulk of gas required to support any given weight, and the fact that the balloon is bodily immersed in a moving medium, without access to any fulcrum by which the force of the air might be turned to account, as in the case of a ship on the water, constitute difficulties that are far from being surmounted. A hand propeller may produce an effect that is just appreciable on a still day; but when a balloon is liable, almost without notice, to find itself moving at twelve miles an hour, or much faster, it is evident that a power of a totally different class is necessary to be of any real use. We should be very glad to see something of greater promise tried in the fair and thorough way in which Mr. Bowdler's gear was tried.

Yellows in the Peach.

If you dig around a peach with the yellows, you will be first struck with a mushroomy smell. Picking out the roots, and examining them with a lens, you will see millions of thread-like fibers, which are the *mycelia* of fungi. These eat the young fibers, and leave only the main roots, through which all the nutriment of the plant has to be gathered; and as an old root is unable to do much more than draw in water, the tree becomes in a measure starved, and the leaves become yellow, just as they would be if growing in poor soil, which, though the plant might have plenty of roots, furnished nothing for the roots to eat. To have plenty of roots and no food is equivalent to having plenty of food and no roots. The effect on the plant is just the same. Remedies which look to the destruction of this root parasite are employed. Hot water has done it, so has a weak solution of salt; others have found a solution of potash succeed. The exact nature of this fungus, so far as we know, has not been investigated to entire satisfaction. Fungi are very polymorphous. This one may enter into the circulation



MR. BOWDLER'S BALLOON EXPERIMENT.—Fig. 2.

of the plant, and exist in that case as an apparently distinct species, extending through the tissue, and destroying it as it goes. This seems likely from some experiments by Mr. Thomas Taylor, of the Department of Agriculture. At any rate it is generally believed that a bud, or even a knife used in pruning a diseased tree, will communicate the disease to a healthy one.—*The Gardener's Monthly.*

PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

We give below abstracts of papers read before the Hartford Convention, concluding our report of the proceedings of that body. Under the head of the

MOLECULAR VOLUME OF WATER OF CRYSTALIZATION,

Professor F. W. Clarke stated that, when water unites to form a hydrate or a crystaline salt, contraction ensues, and by studying that contraction we get at curious results. In the case of water of crystalization, Professor Clarke has studied over 30 salts, and in every case the molecular volume of the water is about 14. With water of hydration no such regularity is found. Evidently, then, when water unites with an anhydrous salt from water of crystalization, all the condensation which occurs is on the part of the water, the volume of the molecule of the salt itself remaining unchanged. Referring to the molecular heat of similar compounds, the same speaker said that it is commonly thought that similar compounds have equal molecular heat. This is only approximately true. In comparing about 20 series of similar compounds, Professor Clarke finds that the molecular heat increases slightly with the molecular weight, though in a very different ratio.

Professor Lovering exhibited a drawing of a new instrument which he had devised, by which vibrating flames reflected in a revolving mirror could be made visible to a large audience. Paymaster General Alvord, U. S. A., explained a table, from which it appears that the annual death rate of the officers of the army in the period of 25 years, from 1824 to 1848, was 27 per 1,000; the rate for the last 25 years, from 1849 to 1873, was 23 per 1,000, showing a decided decrease notwithstanding the civil war.

Professor T. Sterry Hunt, with reference to

THE SEWAGE QUESTION,

mentioned a new English method which consists in the use of finely divided charcoal, obtained by charring seaweed or street sweepings. Only one fourth as much charcoal is required as of earth. The odorless and partially dried mixture with this charcoal, after use, is removed from time to time and charred by heating to redness in close vessels like gas retorts, the products of the distillation being water, ammonia, acetic acid, tar, gas, and charcoal, the last being augmented in quantity, and ready for immediate use again, though containing alkalies, earth, and phosphates, which give it a great fertilizing power. From the product of the distillation the chief materials obtained are acetate of lime and sulphate of ammonia, the latter being the most valuable of fertilizers.

The same speaker also described a new wet process of copper extraction, devised by himself and Mr. James Douglas of Quebec. When oxide of copper is brought in contact with protochloride of iron, this is decomposed, the iron being thrown down as peroxide, and the copper converted into a mixture of one third soluble protochloride and two thirds of dechloride, insoluble in water, but soluble in a strong and hot brine. From this solution metallic iron throws down the whole of the copper or metal, regenerating the protochloride of iron, which is now ready to dissolve a fresh charge of oxide of copper, and so on indefinitely, using the same solution over again, the consumption of metallic iron being about two thirds the weight of the iron. To prepare the ordinary sulphurous ores for this treatment, it is only necessary to calcine them at a low red heat. In this process the injurious elements of the ore, such as arsenic, antimony, and tin remain undissolved, and the metallic copper obtained is so pure that it can be made into fine copper by a single fusion.

Professor R. E. Rogers described a new

DIRECT VISION SPECTROSCOPE,

which consists of a thick plate of glass with parallel sides, united to one of the faces of an ordinary bisulphide of carbon prism, or a prism of dense flint glass. According to the amount of dispersion desired, the light is made to enter either on the end of the glass plate or on the opposite face of the bisulphide prism. The results obtained from this instrument are as follows: The dispersion of this compound prism is nearly four times greater than that of the ordinary 60° prism. The mean emergent ray is practically parallel to the incident ray. It does not deflect the ray from its original path. Many Frauenhofer lines are visible by this prism with the naked eye, while with the observing telescope all the prominent lines are clearly reversed, without the use of the slit or collimeter, by merely throwing a strong beam of light by means of a mirror.

Professor C. V. Riley of Missouri, in a very interesting paper on

INSECTS,

described those more particularly associated with *sarracenia variolaris* (spotted trumpet leaf). It referred to the insect catching powers of those curious plants, the flytraps (*dionæa*) the sundews (*drosura*), and the pitcher plants (*sarracenia*), which have of late awakened renewed interest by virtue of the interesting experiments and observations on their structures, habits and functions, lately recorded by Professor Asa Gray.

The leaf of *sarracenia* is a trumpet-shaped tube, with an arched lid covering, more or less completely, the mouth. The inside is furnished with perfect *chevaux de frise* of retrorse bristles, commencing suddenly about an inch from the base, thence decreasing in size until, from about the middle to the mouth, they are so short, dense, and compact that they form a decurved pubescence which is perfectly smooth and velvety to the touch, especially as the finger passes downward. Under the hood, again, many of them become large and coarse. Running up the front of the trumpet is a broad wing with a hardened border, parting at the top and extending around the rim of the pitcher. Along this border, but especially for a short distance inside the mouth, and less conspicuously inside the lid, there exude drops of a sweetened, viscid fluid, which, as the leaf matures, is replaced by a white, papery, tasteless, or but slightly sweetened sediment or efflorescence; while at the smooth bottom of the pitcher is secreted a limpid fluid possessing toxic or inebriating qualities.

The insects which meet their death in this fluid are numerous and of all orders. Ants are the principal victims, and the acidulous properties which their decomposing bodies give to the liquid doubtless render it all the more potent as a solvent. Scarcely any other hymenoptera are found in the rotting mass.

Two species are proof against the siren influences of the destroyer, and in turn oblige it, either directly or indirectly to support them. The first is *xanthoptera semicrocea* (Guen.) a little glossy moth which may be popularly called the sarracenia moth. It walks with perfect impunity over the inner surface of the pitcher, and is frequently found in pairs within the pitchers soon after these open in the early part of the season, or about the end of April. The worm riots in the putrid insect remains, bores through the leaf, and burrows into the ground; there contracting to the pupa state, in a few days it issues as a large two-winged fly called *sarcophaga.*

Professor Riley concludes: That *sarracenia* is a truly insectivorous plant, and that by its secretions and structure it is eminently fitted to capture its prey.

That those insects most easily digested and most useful to the plant are principally ants and small flies, which are lured to their graves by the honeyed path, and that most of the larger insects fall victims to the peculiar mechanical structure of the pitcher.

That the only benefit to the plant is that the liquid manure, resulting from the putrescent captured insects, mostly descends the root stalk, and probably through tubular cells, passing through the petiole into the root.

That *sarcophaga* is a mere intruder, the larva sponging on and sharing the food obtained by the plant, and the fly attracted thither by the strong odor. There is nothing to prove that it has anything to do with pollination.

That *xanthoptera* has no other connection with the plant than that of a destroyer, though its greatest injury is done after the leaf has performed its most important functions.

That neither the moths nor the flies have any structure peculiar to them, that enables them to brave the dangers of the plant, beyond what many other allied species possess.

In a paper on the

COTTON WORM,

Professor A. R. Grote concluded that it is not indigenous with us, but an annual; not a denizen, but a visitant, unable to contend with the variations of our climate; and he believes that the process of artificial extermination may be simplified by limiting the period of successful attack and doing away with certain proposed remedies. The agent of destruction must be directed against the first brood in each locality; and concerted action on the part of the planters, where the remedy is to be applied, will be necessary.

THE CLOSING EXERCISES,

which followed the conclusion of the reading of the papers, consisted in passing resolutions accepting the invitation to make Detroit the next place of annual meeting, and fixing the time as the second Wednesday in August. Resolutions were also passed to take measures for representing to Congress the importance and desirability, in the opinions of the Association, of having a new census taken in 1875 with reference to the Centennial celebration; and to take measures for urging upon the legislature of Massachusetts the need of a new geological survey of that State. The following officers were then elected for the coming year: President, Professor J. E. Hilgard, of Washington; vice president for section A, Professor H. A. Newton, of New Haven; vice president for section B, Professor J. W. Dawson, of Montreal; General Secretary, Professor S. H. Scudder, of Boston; permanent secretary for five years, F. W. Putnam, of Salem, Mass.; treasurer, W. S. Vaux, of Philadelphia; secretary of section A, Professor S. P. Langley, of Pittsburgh; secretary of section B, Professor N. S. Shaler, of Newport, Ky.

NEW TREATMENT FOR THROAT AND NOSE DISEASES.

We have been much interested, lately, in an examination of a comparatively new system of treatment of diseases of the throat and nose, maladies probably the most prevalent in the variable climate of our Northern States during the fall and winter months. Physicians who employ the old-fashioned probang are well aware of the difficulty in reaching therewith the very sensitive parts to which local application of a remedy is necessary; and as a substitute for this uncertain instrument, apparatus is by some employed, by which the medicine, in a finely divided state, is blown against the proper spot.

The system to which we refer is the last mentioned process, brought to a remarkable degree of certainty and perfection through a series of entirely novel inventions, in the shape of peculiarly constructed instruments, which are the result of long acquaintance with and experiment upon the diseases in question, by Dr. Otto Füllgraff, the founder and manager of the Bond Street Homœopathic Dispensary, and an eminent practitioner of this city.

By means of this apparatus, the surgeon can direct a powerful spray of liquid or cloud of powder, infallibly upon the part to be treated. Connected with the atomizing arrangement are tubes of vulcanized rubber and nickel-plated metal, provided with movable tips of various shapes and bent at different angles, so that the skillful operator, aided by ingeniously contrived reflectors, can direct his medicine directly to the vocal cords or into cavities impossible to reach by any other method.

An idea of this operation may be obtained from the an-

nexed engraving. From the bottle which holds the remedy a metallic piece arches over the cork and then passes at right angles over the tongue, at the root of which it is shown making another angle and passing over the epiglottis down into the larynx; so that the medicated fluid, forced by the air driven into the bottle by the compression of a bulb attached to the small projecting tube, is impelled directly into the larynx, trachea, and bronchial tubes. The end of the instrument terminates in a movable tip, which may be unscrewed, and another substituted, so as to throw a spray of finer or coarser particles.

Through this apparatus many important cures have been recently effected, notably in cases of well known vocalists, suffering from diseases of the throat, nasal catarrh, etc., due to our changeable climate. The instruments are, of course, not patented, and are, therefore, open to the examination and imitation of the profession. They have probably been the means of averting an immense amount of suffering among the poorer classes of this city, through the dispensary above alluded to, where, for the past twenty years, Dr. Füllgraff has, with that lack of ostentation which marks the true philanthropist, gratuitously given to hundreds of thousands the benefit of his skill. The institution now treats a larger number of cases than even the more pretentious dispensaries, largely subsidized by the city and State, 38,830 poor people of every nationality having been aided, surgically and medically, during 1873, directly at the dispensary; 5,589 outdoor visits were made by the medical staff, and 98,601 prescriptions given—and all this without fee or hope of reward. It is a grand and genuine charity, and, while it is greatly to be regretted that its pecuniary support comes more from the private practice of its generous founder than from city and State coffers, the institution is one of which, as a community, we may well be proud.

The Worker's Friend.

"Partly by the information I have received from the SCIENTIFIC AMERICAN, and partly by the advice it has contained in reference to the benefits of study, I have been raised from the position of a laborer in a lumber yard, at $6 a week, to that of foreman, at a salary of $1,200 a year. I therefore consider the SCIENTIFIC AMERICAN to be the worker's best friend."

Such are the casual remarks of one of our correspondents in a recent letter. They are an example of hundreds of similar expressions which we receive from various parts of the country. It is always a gratification to us to be thus assured of the usefulness of our journal in the hands of the great body of practical workers to whose interests it is devoted.

Premium for the Best Circular Saw.

The Board of Commissioners of the Fifth (1874) Cincinnati Industrial Exposition offer a special premium of $100 in gold for the best circular saw. The competition is to be determined under conditions as follows: All saws competing shall be of uniform diameter, namely, 56 inches. They may have either solid or inserted teeth. The gage to be at the option of the exhibitor. The eye of the saw to be 2 inches diameter; the pin holes ⅛ inch, and 3 inches from center to center. Each saw is to be submitted to a thorough practical test, upon a left hand mill provided for the purpose. Diagram cards are to be taken from the engine during the trial of each saw, by a disinterested expert, selected by the jurors. The test is to be made during the week beginning September 21, 1874. Other details of the examination are to be determined by the jurors.

PRIZES FOR HAND TURNING.—The Company of Turners of London, in continuation of their action in former years, propose to give, in 1874, their silver medal and the freedom of the company and of the city of London to any one workmen or apprentice in England who may send in the best specimens of hand turning for the year. Last year the prizes were awarded for turning in ivory and stone; this year the material to be used will be brass or gun metal.