Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year - - - - - - - - $3 00
One copy, six months - - - - - - - - 1 50
CLUB RATES { Ten copies, one year, each $2 50 — 25 00
Over ten copies, same rate, each — 2 50
TO BE HAD AT ALL THE NEWS DEPOTS.

VOL. XXVII., No. 18. [NEW SERIES.] *Twenty-eighth Year.*

NEW YORK, SATURDAY, NOVEMBER 2, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

A MILLION DOLLAR TELESCOPE.

The *Manufacturer and Builder*, in noticing the fact that Congress has appropriated $50,000 to pay for a 27 inch refractor for an Astronomical Telescope, calls attention to the want of liberality usually shown by our public men, in respect to expenditures for scientific instruments. It thinks there is no difficulty in obtaining money to build engines intended for destruction, such as monitors, but, when it comes to devices that are solely capable of adding to human knowledge and augmenting human happiness, then the purse strings are drawn tight, and money grudgingly given. Our cotemporary thinks that an appropriation of a million dollars to build a large telescope ought to be passed, and that science ought to be aided and encouraged in the same liberal style on all suitable occasions. The editor further believes that if such a telescope were to be capable of killing people at the rate of a thousand souls a minute, the million dollars would have been paid out and the machine constructed long ago.

It may be interesting, in regard to this matter, to give an account of the largest telescope constructed, and a few hints about what we may expect of a million dollar telescope.

The large telescope, commenced by William Herschel in 1785, was finished in 1789; its objective was a reflecting metallic mirror of 4 feet diameter and of nearly 2,000 pounds weight; the focal length was 36 feet. It magnified objects 6,000 times in their linear dimensions, or 36,000,000 times their superficial area. Herschel found, however, that the penetrating power depended on the size of the objective. A small objective of long focus causes the rays to be diffused so much that little light is left; and by using the telescope with different sized diaphragms, he found that, while with a small opening he could only see to a certain distance in the heavens beyond the stars visible by the naked eye, he saw much farther by using the full opening of his telescope. By the latter, he saw nebulæ so distant as to totally escape vision when using a diaphragm with smaller opening, which was equivalent to a smaller objective. He further found that some nebulæ could be resolved into stars, and others could not; and it was supposed that this was a confirmation of La Place's nebular theory, these nebulæ being assumed to be future planetary systems in their incipient condition.

The next large telescope was constructed by the late Lord Rosse. It had a reflecting objective of 6 feet diameter, and a focal length of 53 feet, and magnified objects over 10,000 times in linear dimensions, or 100,000,000 times in their superficial area. With this telescope, many of the nebulæ not resolvable into stars by Herschel's telescope were resolved, and it was a question whether all nebulæ could not thus be resolved, if only a still larger telescope than that of Lord Rosse was used.

This problem, however, has since been solved without building such a large telescope, as the spectroscope has proved that most of these unresolvable nebulæ consist of glowing hot hydrogen gas.

The magnifying power of a telescope is found by dividing the focal length of the eye piece into the focal length of the objective. It follows from this that the magnifying power increases with the focal length of the objective, which regulates the length of the tube, and is in an inverse ratio to the focal length of the eye piece. Some very long telescopes have been made, of over 100 feet length, mounted on a stick in place of a tube; but as the objectives were very small, the great magnifying power was counterbalanced by the small amount of light they received; and they had a total lack of penetrating power, and could be of use only for observations of such highly luminous celestial objects as the sun. For a successful instrument, the size of the objective must, therefore, be proportional to the length of the focus; and an objective of say 12 feet diameter, with a focal length of 120 feet, would be the thing to be desired, unless, indeed, these dimensions could be exceeded. If such an objective is ground to a very true parabolic curve, it can stand a very strongly magnifying eye piece, that is, one of very short focus. Suppose that the objective is so truly ground and polished that it could stand an eye piece of one twentieth of an inch focus, with which to magnify the image of the distant object formed in the focus of the objective; the magnifying power would then be equal to 120 feet divided by one twentieth of an inch, or 1,440 multiplied by 20—28,800 times the linear dimensions, or over 800,000,000 times the surface.

Such a degree of magnifying power would make the moon an interesting object for the geologist, showing the results of ancient volcanic action undisturbed by the effects of air and water. As the moon is at a distance of nearly 240,000 miles, a magnifying power of 28,800 would bring it to a distance of about 8 miles, and then the theory that the moon cannot be inhabited would be practically verified.

In regard to the planets, Mars would be brought to within 4,000 miles, and thus would be apparently 60 times nearer than the moon; and it would have a visual diameter of 50°, or 100 times that of the moon. As this is the only planet which, according to the latest scientific revelations, has conditions so similar to those of our earth as to make it highly probable that it is inhabited, the observations of the same would perhaps be the most interesting of all, as the works of men, such as cities and roads, could certainly be distinguished.

It is impossible to speculate on what such a telescope would discover in regard to the other planets or the vast regions of the firmament; let us hope that some day the amount of capital necessary will be forthcoming, on the most liberal scale, for the progress of the most sublime of all the sciences.

DOWNFALL OF THE PAPER COLLAR RING.

For several years past the members of a Clique, organized for the purpose of attempting the control of the Paper Collar business, and known as the Union Paper Collar Company, have set up and operated on the pretence that they were in possession of certain Patents which covered the exclusive right to manufacture paper collars. Anybody who made paper collars of any sort was, so they claimed, an infringer of their patents, notwithstanding the well known fact that such collars were known and used for many years before their patents were thought of.

By dint of threats of prosecution, and by actual resort to legal persecutions in some instances, this unscrupulous Clique has for a long time held sway over the smaller dealers, compelling them to take licenses and pay unjust tribute money or submit to the meanest annoyances. Indeed, some dealers have been compelled to abandon the business.

In view of these circumstances, it is with considerable satisfaction that we observe that the Collar Clique have at last been brought into Court, where their pretensions have been curtailed to reasonable proportions. We publish an abstract of the case in another column, from which it will be seen that their principal patent claims are declared invalid.

DISCOURAGING PROSPECTS IN ENGLAND.

The late English journals are filled with gloomy forebodings as to the prospects of the poorer classes and the working people for the coming winter. In the cities, and especially London, the repeated building strikes have brought poverty to hundreds; while in the rural districts, where the agricultural laborers have been carrying on a war for higher wages, acres of productive land have lain uncultivated during the best months of the year.

The potato crop, which forms a staple industry among a large number of farmers, has utterly failed. The London *Times* states that growing potatoes are offered at one shilling a rood, without customers. The produce should be worth ten shillings. The face of the country where the potatoes are lying is blackened, and in the most cases the stench plainly indicates the presence of the disease before it is detected by the eye. The retail price is one penny per pound, and the wholesale, seven pounds per tun instead of less than half that sum. An agricultural weekly estimates the loss, if the disease continues its spread as it bids fair to do, at 1,630,000 acres at 4½ tuns per acre, in all 7,735,000 tuns, which, at £4, comes to £39,340,000, or the value of say 10,000,000 quarters of wheat.

Various methods have been tried to prevent this fearful scourge, with but little success. Dr. Hooker, curator of the Kew Gardens, publishes, at the request of Premier Gladstone, the information that parts of the diseased vegetable may at least be saved, by grating and washing, thus extracting the starch. He also suggests that efforts should be made to spread among the poor the use, as food, of the beet root, and the foliage of the turnip and other vegetables, which are now given to cattle.

Another calamity is threatened in the shape of the foot and mouth disease among the domestic animals, which will result in the material increase in the price of meat. The London *Daily News* quotes from a Parliamentary speech, in which it is asserted that, in the five weeks previous, 10,000 cases of cattle and 50,000 cases of sheep had been returned as affected with this contagious disorder.

The outlook is further darkened by the probability of the price of bread being raised. A general strike of the bakers is threatened in London, which, it is feared, if carried into effect, will give rise to extensive and formidable bread riots.

In addition to these other evils, coal is selling at rates largely in advance of previous years. This may be accounted for, both by the troubles among the miners, large numbers of whom have struck for eight hours work, forcing many colliers into idleness, and also by the unusual demand for coal by the iron and metal working trades, the rate of whose yearly consumption has largely increased. Whether the advantage gained by the activity of these industries will compensate for the hardships entailed upon the poorer classes by the enhanced cost of fuel, is, as in all cases where one portion of a population is benefited at the expense of another, at best questionable.

With coal doubled in price, meat advanced and perhaps unhealthy from disease, potatoes, the great substitute for bread, scarce, and bread itself dearer, the prospect for the English working people is not very encouraging.

AN IMPORTANT PATENT EXTENSION DENIED.

The application of Perry G. Gardner, for an extension of his patent of Sept. 28th, 1858, for Improvements in Car Springs, has been rejected by the Commissioner of Patents on the ground that his statement of receipts and expenditures under the patent is vague and insufficient. The patentee granted licenses to use his invention to certain Companies, taking stock in compensation, and alleges that he has received no dividends therefrom; although nothing appears to show that his stock is not of great value, and no pretence is set up that the companies are not doing a profitable business. The Patent Office infers that the patentee has received a large remuneration for his invention, respecting which he withholds, in his statement, all information. Nothing is more common, says the Acting Commissioner, among manufacturing companies than to withhold all dividends, even while making enormous profits, devoting the latter to the enlargement and improvement of their works.

PROFESSOR J. H. PEPPER.

We are pleased to observe the arrival, in this city, of Professor J. H. Pepper, Director of the Royal Polytechnic Institution of London. He comes to this country on a tour of observation.

During his stay, we are to be favored with a few of those striking and marvelous scientific lectures for which he is celebrated, and which have attracted so much attention in London. The first lecture is announced for October 30th, at Steinway Hall in this city. Some of Professor Pepper's experiments with light and electricity are said to be quite astonishing, his appliances for direct illustration being very effective and original.

UNDERGROUND RAILROADS.

The London *Telegraph* gives a vivid picture of the horrors of the underground railroads of that city. It speaks of "the incessant hurry at the subterranean stations, the nerve shaking slamming of every carriage door, the hideous yells of the engines, the difficulty of distinguishing one train from another, or of getting a coherent answer to a question from the fevered and inarticulate officials," and says that "all these peculiarities, with the oppressive atmosphere and the spine-convulsing way of putting on the brakes, render the underground lines as terrible as they are useful."

Is the underground railroad which Mr. Vanderbilt is supposed to be building in this city, or to be making preparations to build, to be of this sort? Already we have troubles of our own in the way of travelling about the city. These are due in a degree to what some one has happily called the "natural depravity of inanimate objects," it is true; but they are none the less a grievance on that account, while the torments already inflicted on us by some of the horse car conductors, the stage drivers, and the hackmen, are worthy of the Spanish Inquisition in its worst days. But if the *Telegraph's* portrayal of the characteristics of the underground railroads of London be not wholly imaginative, what a pandemonium are we preparing for ourselves!—*Evening Post.*

The London Underground Railway is a model of its kind, pandemonium though it is, and the steam road proposed to be built in New York by Mr. Vanderbilt, will not be substantially different from that of London. The presence of the

locomotive in underground tunnels is always productive of many nuisances.

There is but one really practicable plan by which the annoyances recited by the *Post* can be avoided, and a rapid, safe, and agreeable mode of conveyance secured; and that is by the pneumatic system. A working section of this form of railway has now existed here for the past two and a half years, having been built at private expense, for the express purpose of showing to our citizens how excellent and practical the plan is, and how well adapted for the special purposes of rapid city transit.

The section referred to consists of a nine foot railway tunnel extending under Broadway from Warren to Murray street. A strong current of pure air, produced by a gigantic blower, moves through the tunnel, which is thus always kept thoroughly ventilated. A handsome passenger car, carrying twenty persons, traverses the track, being moved back and forth by the air current, which acts upon the ends of the car like the wind upon a sail. Many thousands of people have enjoyed the ride on this pneumatic railway, and have expressed their unbounded satisfaction at the complete, effective, and splendid manner of its operation. The noise, cinders, gas, dust, jerks, and other disagreeable accompaniments of the locomotive are done away with, while a speed equal to the ordinary steam train is easily maintained.

The practical success of the pneumatic method for passenger cars was long ago settled. It cannot compete, in the open country, with the locomotive, in point of economy; but for underground rapid transit, in large cities like New York, where the travel is immense and cars are to be dispatched every minute or two, the pneumatic system promises to be the most comfortable, and the expense of its running is estimated to be about the same as the locomotive plan.

One of the most singular circumstances connected with the introduction of this pneumatic system has been the action of the present Governor of the State, Hoffman. The amended charter of the Beach Pneumatic Transit Company, which gives authority to carry freight only, was signed by him. The great success of the method and the urgent demands of the citizens of New York for the application of the system to passenger transit induced the Company to ask an extension of their privileges to passenger service.

The plans of operation, construction, and route—the latter being from the Battery under the whole length of Broadway—have been widely discussed by the press and approved by the public. For two successive years, both branches of the State Legislature have, by very large majorities, passed the necessary measures authorizing the Company to proceed with its works and construct a passenger road; but each year the Governor has withheld his signature and vetoed the enactment, one of his chief assigned reasons being that a city engineer, an appointee of the notorious Sweeny, had advised him that the construction of the works under Broadway would be impracticable. This was in the face of the direct testimony of all the leading architects and several of the most experienced civil engineers that the construction was entirely practicable.

The Governor has, however, signed several other bills for steam roads in New York, one of which, the Vanderbilt, soon, it is said, to be commenced, is to run under Fourth avenue; another, the Swan Three-tier, that is, a combined underground, surface, and elevated steam railway, is to be located west of Broadway; another, the Gilbert, an elevated steam railway, also to be located west of Broadway. In addition to these, passed last year, the Governor had previously approved the Central Underground charter for a steam road, now nearly defunct by its own conditions; also the Sweeny Viaduct charter, for an elevated steam road.

The construction of every one of these roads involves more engineering difficulties than that of the Beach Pneumatic Transit road. The latter has the most central, the straightest and best route; this is admitted by all the engineers.

It will thus be seen that the city of New York is blessed with a superabundance of steam railway charters; but the only corporation that has so far actually done anything underground, to meet the wants of the public, is the Pneumatic Transit Company. It is a shame that the consummation of this important enterprise should be so delayed. The Legislature meets again in January, when a new Governor will be inaugurated. The Company will renew their application for the privilege of carrying passengers, and, as soon as it is granted, proceed with the extension of their works.

HANGING WALL PAPER.

Many persons living in remote places defer re-papering their apartments on account of the difficulty of procuring skilled labor in this branch of industry; but it is really such a simple task that there is no reason why any one of ordinary capacity should not do it with as little trouble as whitewashing. The directions here given are the result of practical experience and, if observed, will enable any one to hang paper as well as an expert.

Supposing you have decided to paper your apartment anew: the first thing to be done is to remove the old paper, if there is but one thickness on the wall, it is not necessary, as this will not do any harm. It is only where layer after layer is put on that the apartment becomes offensive from the condensation of vapors, accumulating with years until at last they become dangerous sources of disease. This is a well established fact, as recent investigation by a Board of Health in London disclosed that the several layers or thicknesses of wall paper, in houses in a crowded part of the city, were absolutely damp with noisome deposits accruing from defective ventilation.

To remove the old paper, take a common whitewash brush and a pail of water. Wash the wall all over and you can easily tear the paper off in long sheets, and so render the surface clean again. Care must be taken not to remove or break the surface of the under layer, or ground; for if this is done, there will be a ridge or seam wherever it is torn that will show badly if your new paper has a light ground; if it is dark and the pattern is in arabesque, it matters little, as it will not show.

Having cleaned or removed the old paper, take a roll of the new that you desire to apply and hold it up to the wall; arrange it so that the pattern will show evenly at top and bottom, if possible, and then cut off one length. Have ready a table or a board long enough to take the whole piece; then use the first strip cut as a guide, and match all the rest to it. You may cut all the paper up for the straight part of the wall, leaving the intervals over the door and windows to be done at leisure, or with the waste pieces that always accumulate. In cutting the length, be careful to cut the bottoms and tops perfectly square across, and not zigzag, or at hap hazard, for it looks badly to see the pattern mismatched, or a ragged end where it meets the wash board. There are two white edges or selvages on wall paper, one of which must be cut off. Be sure and cut off the right one, or the one that you intend to paper from, and cut all the others at one time. In applying the paper, you will doubtless find that between the doors and windows the pattern will not come out right, leaving a hand's breadth or so to fill up between the frame and the last piece applied. This is of no consequence, as it can be easily filled up by a piece specially cut for it. Be careful and see that you do not reverse the paper or get it upside down in hanging. You can easily tell the right side up if the pattern is in vines, leaves, or geometrical shapes, by noticing which side the shading of the figures is on.

Having cut all the paper ready to apply, roll it up and lay each piece on one side, or lay them all in a pile. Have ready a smooth boiled paste of wheat flour (sound flour, not sour), a whitewash brush, and a board, or table, long enough to take the whole sheet in one length. Make the paste quite thin, not thicker than molasses and as smooth as a custard. Have a chair, step ladder, or table ready, on which you can stand and reach to the top of the wall. Then take your first piece of paper, lay it on the table and apply the paste; not too thickly, being particular to touch the edges and top and bottom well. Then take the sheet by the top, raise it off of the table and support it with one arm (on the right or dry side, of course), and put it up to the wall. Keep it entirely clear of the wall until you fasten the head of the sheet, but previous to this, run your eye down the side and see if it hangs square with the door frame. If it does, have a clean towel or cloth ready, and move it *horizontally* in wavy strokes over the sheet until the bottom is reached, but do not in any case rub up and down or draw the paper in folds; if you do, there will be ridges and wrinkles in it, which destroy the appearance and can never be got out. Hang the sheet properly at first and then follow it down from the top, rubbing across it; and there will not be a wrinkle in it. Apply the second sheet in the same way, and be careful that you match the figures properly. Success depends on this, for nothing looks worse than to see the continuity broken off or a white seam showing between the pattern, up and down the wall where the sheets do not meet. When the corner is reached, if the sheet does not come evenly to the opposite wall, it is better to cut it lengthwise and paste it on; then take the fellow to the piece and apply it also, matching the figures of course. If you endeavor to make the sheet reach round, you will make a bad job of it. Always clean well the table where you paste, so that no paste will get on the pattern; if it does, the colors will run or smudge, and soil the sheet. Gilt papers with delicate lavender grounds require great care in this respect, as the least spot shows badly. This is all there is to be observed in hanging paper, and there is nothing that any one cannot do with a little practice.

Some care or discretion must be taken in selecting papers for the purposes or places they are intended to be put in. Rectangular or geometrical patterns do not look well in a bed room or a sitting room, as they impart a severe and formal appearance that is especially wearisome after a few weeks. Neither is a paper with dark stripes at frequent intervals desirable; the stripes give the effect of battens nailed over boards or rough carpenter's work, and divide a room off with hard lines that tire the eye whenever it rests upon them. All paper ought to impart a clean, cheerful aspect to a room, adding to the homelike appearance and bearing evidence of the taste of the occupants. Never put bordering on the bottom of the wall, as it takes from the hight and makes a boundary for the eye to rest upon where none is desirable. Dark grounds in papers render rooms not fullylighted darker still, and give a somber effect which is very depressing; while open chambers with white hangings have a cold and chilly aspect which it is equally desirable to avoid. No rules can be given for selecting papers; what seems desirable in one case or to one person is objectionable to others, and every one will of course suit themselves in this respect.

EDWIN MARCUS CHAFFEE.

Edwin Marcus Chaffee, a well known and prominent manufacturer of india rubber goods, died recently at Bristol, R. I., in the 65th year of his age. Mr. Chaffee was contemporary with Goodyear, Hayward and Day, and like them was also an inventor, having devised, in 1836, the devices known in the rubber business as the "Machine Patent." He began his career in 1830 and was one of the organizers of the Roxbury Rubber Company; during the past five years, he has been connected as director and secretary with the Providence and National Rubber Company.

Mr. Chaffee did not meet with the pecuniary success to which his inventions and industry entitled him, but, far from being discouraged at misfortune, he persevered in experimenting upon and perfecting new machinery up to within two weeks of his demise. He was one of the sufferers of the poisoning affair at the National Hotel in Washington some years ago, a circumstance which rendered him an invalid and eventually proved the direct cause of his death.

PROFESSOR JOHN W. FRAZER.

We much regret to announce the death, suddenly, on the 12th of October, of Professor John W. Frazer, one of the editors of the *Franklin Journal*, and Professor, for more than thirty years past, of Natural History and Chemistry in the University of Philadelphia, Pa. He was 63 years of age. Professor Frazer was a man of extensive learning and varied attainments.

WILLIAM PRESCOTT SMITH.

Mr. William Prescott Smith, Master of Transportation on the Baltimore and Ohio railroad, died on the 13th of October last. Mr. Smith was closely identified with the railway interests of the country, and more especially with those of the road of which he was the actual manager at the time of his death.

SCIENTIFIC AND PRACTICAL INFORMATION.

BALL LIGHTNING.

An esteemed correspondent, J. R. A., of R. I., was surprised at the letter of J. H. P., published on page 148 of our current volume, and states that in 1859 in the Shetucket valley, Conn., he had a view of a stroke of this kind of lightning at about eight rods distance. It struck a tree, rent it from top to bottom, passed off to a cart tongue laying near, into and through a pile of railroad ties, and into the railroad track about two rods distance. It was seen by six other persons, and the size, as it appeared to all, seemed to be as large as a bushel basket. They were in a building on a rise of ground facing the tree, and had a most perfect view of it. Undoubtedly there are a good many in the United States who have seen such strokes, if they would take the trouble to answer.

THE SUN AND THE ORIGIN OF STORMS.

Mr. John Hepburn says: "I have seen that all gusts coming up in the morning come from the eastward, all about noon from the southward, and all after sunset from the westward; thus clearly proving, to my mind, that the rays of the sun drive the storm, as it were, away from him after their electricity has fired and lit it up. Let the interested please observe, and they will find it so, I believe, in all cases.'

NEW GALVANIC PILE.

A new galvanic pile, invented by M. Morin, is intended to avoid the inconvenience caused by the deposit of copper upon the surface of the zinc, or upon the porous cup. The pile consists of a cylinder of copper surrounded by a concentric cylinder of zinc, between which two cylinders is a third cylinder of filtering paper. There is difference enough in the size of these cylinders to leave concentric annular spaces between the paper and the copper and the paper and the zinc. The former space is filled with sand, and the latter with a stratum of flowers of sulphur. The whole is immersed in sulphate of copper.

Such a pile, it is said, has operated during five months with so little variation that the inventor believes it would work equally well for an additional five. During these five months, the current has been continuous without the need of once touching the battery.

A SIMPLE HYGROMETER.

A new hygrometer has been invented by M. G. Smiths, of Paris, France, in which a salt of cobalt is the essential ingredient. A solution is made of the salt of cobalt, common salt, and gum arabic; into this, strips of paper are dipped and allowed to dry. They will take on a blue color in a dry atmosphere, and become rose colored if the atmosphere be humid.

FORMATION OF CERTAIN METALLIC SULPHIDES.

Privoznick finds that copper, in contact with sulphuretted sulphide of ammonium is transformed into a blue bisulphide and a protosulphide. This is a means for obtaining the sulphides of ammonium, potassium and sodium in a colorless state. Silver becomes covered with a gray crystalline crust of sulphide of silver. Tin and nickel dissolve in appreciable quantities in the polysulphides of ammonium. Iron is covered with a black deposit. The solutions of hyposulphite of soda transform also, slowly, copper and silver into sulphides, with the formation of sulphite of soda.

CONCENTRATING SULPHURIC ACID TO 66° BAUMÉ.

M. de Heuiptume proposes to use a lead-lined vacuum pan for this purpose. The lead is not sensibly attacked by the acid unless the temperature is 200° or over, while in air the sulphuric acid will not boil except at 325°; in the partial vacuum of the pan, 3 to 4 centimeters of mercury, it will readily boil at 190°. The lead, however, softens at this temerature, and is subjected to a considerable pressure from without; and to avoid this difficulty, it is proposed to place in the pan sandstone balls, etc., which are not attacked by the acid.

CRYSTALLINE PHOSPHIDE OF IRON.

J. Sidot reports the following result: Phosphorus vapor was passed over metallic iron in the ordinary method of making phosphide of iron. The product was then calcined in an ordinary crucible with the intention of volatilizing the excess of phosphorus. On breaking the fused mass when cool, the