Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

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

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included.... $3 20
One copy, six months, postage included . 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

☞Single copies of any desired number of the SUPPLEMENT sent to one address on receipt of 10 cents.

Remit by postal order. Address

MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly, every number contains 16 octavo pages, with handsome cover, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5 00 a year, postage paid, to subscribers. Single copies 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

VOL. XXXIX., No. 9. [NEW SERIES.] *Thirty-third Year.*

NEW YORK, SATURDAY, AUGUST 31, 1878.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 139,
For the Week ending August 31, 1878.

THE RIGHTS OF INVESTIGATORS.

In the SCIENTIFIC AMERICAN SUPPLEMENT for July 20, 1878, there was published an article entitled "How to Build a Working Phonograph," with working drawings for the construction of a cheap and practical instrument. In the SCIENTIFIC AMERICAN of August 24 we described and figured "a simple phonograph," in such a manner that any clever boy could make therefrom an instrument that would illustrate perfectly the essential mechanism and action of that wonderful invention.

In so doing we have only carried out the wish of the inventor, as expressed to us, in helping to give the widest publicity to his invention. The company which has purchased the right to make the phonograph for commercial purposes, however, take a different view of the matter, and protest that it is not only inconsistent on our part so to encourage infringements, as they term it, but illegal on the part of our readers to follow the directions we have given for making phonographs for experimental purposes. In some instances, we are informed, such makers have been threatened with legal penalties for doing what they have a perfect right to do; and possibly some may be deterred from pursuing their investigations in this direction, through fear of offending the patent law, and so involving themselves in legal difficulties.

The law on this point is not obscure. Investigators have rights as well as patentees; and among these is the right to make any patented article for the purpose of ascertaining its sufficiency to produce the described effect; in other words, for testing its practical utility. It is only when the machine or other article is made for use or sale, with the intent to infringe the patent right and deprive the owner of his lawful reward, that the act becomes an offense against the law. When a machine is made for the "mere purpose of experimenting on the sufficiency of the specification," or—as was held in Jones *vs.* Pierce, Webs. Pat. Cas., 125, Patteson, J.—for the maker's "own amusement, or as a model," there is no infringement.

If this were not the case the progress of invention would be very seriously hindered: improvements would be next to impossible; and practical investigators and students—from whom most inventions come—would be grievously hampered at every stage of their progress. Unfortunately the purchasers of patents are too apt to construe their rights so as to make them cover pretty much the entire universe, and, if they could have their own way, would allow no one to move in any direction without their consent. This may be a natural outcome of human selfishness; but it is not at all in accordance with the spirit of the patent law.

As it appears to us, the parties controlling the phonograph, like the telegraph companies, have missed, or rather have refused to avail themselves of, a most profitable field of operation, in not meeting promptly the eager public demand for experimental instruments. Thousands of instruments could have been sold, at a price affording a large profit, though really low, to persons who would have been glad to buy them as curiosities, or for the purpose of studying their singular properties and effects; this without interfering in the least with the use of more costly and perfect instruments for business purposes. By refusing to meet this proper demand, they have simply compelled investigators to make their own models; and they have no right now to complain.

THE PLANET VULCAN.

After twenty years of dispute, complicated by many doubtful and conflicting observations, the intra-Mercurial planet discovered by the Parisian physician, Lescarbault, will probably now have to be admitted to full standing among the planets. The readers of the SCIENTIFIC AMERICAN will recall the numerous communications and articles with reference to this planet, printed in our issues for October, November and December, 1876, and the more recent article of May 25, 1878, when the belief was expressed that at the approaching eclipse the disputed planet would be found not far from the sun.

Ever since Le Verrier completed his demonstration of the existence of a disturbing body somewhere between Mercury and the sun, not a few astronomers have been convinced that only a favorable opportunity was necessary to verify by sight the evidence of mathematics.

Among these was Professor Watson, whose confidence was so strong that he went to Colorado determined to make the search for Vulcan his chief business. He said to a townsman on his return: "I was satisfied that there was a planet within the orbit of Mercury, just as I am satisfied that there is one outside the orbit of Neptune. The perturbations of those planets, and some other phenomena, cannot be explained on any other hypothesis. So when I went there I fixed on my plan and stuck to it. I determined to sweep south of the sun, and to keep within a small space We had but three and one half minutes, and the time was too short to try to get over too great a space I meant to search that much thoroughly, and so reduce the amount for future astronomers should I not succeed. It was on the fifth sweep that I saw the object."

In his report to Rear Admiral Rodgers, Superintendent of the United States Naval Observatory, Professor Watson says. "I have the honor to report that at the time of totality I observed a star of the four and a half magnitude in R. A. 8h. 26m. dec. 18° north, which is, I feel convinced, an intra-Mercurial planet. I observed with a power of forty-five, and did not have time to change the power so as to enlarge the disk. There is no known star in the position observed, and I did not see any elongation, such as ought to exist in the case of a comet very near the sun. I will hereafter report to you fully in regard to observations made. The appearance of the object observed was that of a ruddy star of the four and a half magnitude. The method which I adopted prevents the possibility of error from wrong circle readings; besides I had memorized the Washington chart of the region, and no such star was marked thereon. By comparison with the neighboring stars on Argelander's scale, the magnitude of the planet would be the fifth, although my direct estimate at the time of the observation was four and a half, as stated."

Speaking of the discovery, the English astronomer, Mr. Lockyer, said that he did not look for Vulcan and did not see it, though he believed in Le Verrier's prophecy that it would be found at some time. He added: "We may rely upon Professor Watson's statement that it is not a comet, and it is certainly not a star, therefore it must be a planet, and, from its position, an intra-Mercurial one."

Much to Professor Watson's delight his discovery was in a measure confirmed by that of Mr. Lewis Swift, of Rochester, who was at a neighboring station. Mr. Swift's observation seems to have been, in a sense, accidental, yet there is no reason to question its scientific value. In giving an account of his discovery to the Rochester *Democrat*, Mr. Swift says: "About one minute after totality two stars caught my eye about three degrees, by estimation, southwest of the sun. I saw them twice and attempted a third observation, but a small cloud obscured the locality. The stars were both of the fifth magnitude, and but one is on the chart of the heavens. This star I recognized as Theta in Cancer. The two stars were about eight minutes apart. There is no such configuration of stars in the constellation of Cancer. I have no doubt that the unknown star is an intra-Mercurial planet, and am also inclined to believe that there may be more than one such planet."

AMMONIA IN THE AIR.

Dr. R. Angus Smith, who has done so much for the chemistry of the air, lately read before the Manchester Literary and Philosophical Society a paper on the distribution of ammonia, in which he described the simplest method yet proposed for determining the amount of ammonia in the air. And since such ammonia may be taken as an index of the amount of decayed matter in any locality, the hygienic importance of an easy test for it is not small. The availability of the proposed test arises from the circumstance that ammonia is deposited from the air on every object exposed thereto. "If you pick up a stone in a city, and wash off the matter on its surface, you will find the water to contain ammonia. If you wash a chair or a table or anything in a room, you will find ammonia in the washing. If you wash your hands you will find the same, and your paper, your pen, your table cloth, and clothes all show ammonia, and even the glass cover to an ornament has retained some on its surface." In short ammonia sticks to everything, and can be readily washed off with pure water. Hence Dr. Smith inferred that he might save himself much of the trouble he had been taking in laborious washings of air to determine the presence of ammonia, and gain the desired end by testing the superficial deposit of ammonia which gathers on clean substances during ordinary exposure. Accordingly he suspended small glass flasks in various parts of his laboratory and examined them daily, washing the outer surfaces with pure water, and testing at once for ammonia with the Nessler solution. Subsequently a great many observations were made by means of glasses exposed to air in door and out, where the air was sweet and where it was foul. By using glasses of definite size it was easy to determine whether the ammonia in the air was or was not in excess. In his laboratory experiments ammonia was observed when the glasses had been exposed an hour and a half.

Of the practical working of the test Dr. Smith remarks that it must not be forgotten that the ammonia may be pure or it may be connected with organic matter; and consequently this mode of inquiry is better suited as a negative test to show that ammonia is absent than to show what is present. When ammonia is absent we may be sure that the air is not polluted by decaying matter; when it is present there is need of caution. Dr. Smith adds that he hopes to make this a ready popular test for air, a test for sewer gases, for overcrowding, for cleanliness of habitations, and even of furniture, as well as for smoke and all the sources of ammonia. Of course it must be used with consideration and the conclusions must not be drawn by an ignorant person. The entire paper will be found in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 139.

SOFT VS. HARD IRON.

A series of most careful experiments recently undertaken by Mr. David Kirkaldy, to find out the relative merits of wrought iron plates manufactured by Krupp, of Essen, and those made in Yorkshire, demonstrated that, as regards the elastic limit, or the amount of load at which the elasticity becomes impaired, the result was in favor of the Yorkshire plates by 9·2 per cent, which is attributed to their greater hardness; but that the ultimate or breaking stress was in favor of the Essen plates by 5·5 per cent, the softness of the iron, as shown by the contraction at area of fracture, being also in favor of this latter.

To ascertain the reduction of tensile strength by drilled and punched holes, 42·5 per cent of the plates was removed by rivet holes made in their centers 2½ inches apart between

centers, and the actual mean loss of strength recorded on the Essen plates amounted to 38·05 per cent, and on the Yorkshire to 42·95 per cent; the difference showing unmistakably the value of the softer iron, and that the ultimate stress borne is much affected by this quality.

Disks 12 inches in diameter and ½ inch thick were then subjected to a bulging stress by being pressed into an aperture 10 inches in diameter by a bulger. The difference in favor of the Essen plates was 17·8 per cent. In resistance to a bending stress also the results showed favorably for Essen plates in both hot and cold bending tests. Some plates showed cracks when bent at angles of 50°, while many of the Essen specimens bent as much as 180° before cracking These results are of great importance to architects and engineers in determining the relative values of soft and hard irons for their purposes.

THE NEW DIVINITY.

It has been claimed that modern socialism, although professedly atheistic, is in reality the beginning of a new religion. The testimony received by the Congressional Labor Committee seems, in the main, to bear out the assertion. However conflicting, in every other respect, might be the views of the socialistic reformers that thronged the committee room, they all seemed to be in substantial accord on one point, namely, the source from which relief from all industrial troubles was to come. Their sublime confidence in the beneficent capacity and character of this new divinity would have been beautiful if it had not been so absurdly ridiculous—ridiculous as every phase of fetich worship must be to those who have passed beyond it.

The troubles that afflict the poor are traced by socialists chiefly to the oppressions of capital made possible by the maladministration of government, itself corrupted by human selfishness and dishonesty. In the interest of hereditary wealth and position government does no end of wicked things, and neglects to do justice to the poor in almost everything. Indeed, in whatever governments may undertake to do, jobbery and favoritism on the part of those empowered to direct the work invariably result in a squandering of the means provided, and almost always in an increase of the burdens of the poor, with no compensating benefit. Down with the Government! Oust the rascals that in the name of justice plunder the public treasury, and share the spoils with the rich, who use their ill-gotten gains for the oppression of their betters, the producers!

This is the socialistic cry, from Russia to San Francisco. Yet, like the poor savage of Ashantee who makes a god of the snake that bit him, the one unanimous demand of the socialists before the Labor Committee was that government should undertake to do everything.

By what process of mental jugglery the idea of government is separated by them from human agency and made a god to do impossibilities—incorruptible and of unfailing wisdom—there is no means of telling; yet the fact remains that these unfortunate victims of government, according to their own account, want nothing so much as more government. In the name of liberty they demand the most absolute of despotisms. Denouncing the incompetence and rascality of all men in power, they would turn over to government (and so, of course, to the control of officials) all the means of wealth, all the processes of production, all the distribution of this world's goods. In future years this feature of the socialistic movement will, we believe, be looked upon as one of the most curious and unaccountable of epidemic delusions.

With not a few of the objects of the socialistic reformers we are in hearty sympathy. To no small degree they are working at, if not working out, the true aims of American institutions, as they themselves will discover in time, when they come to know more about our institutions. When to their zeal they add knowledge—practical knowledge, not idle dreams and mischievous misapprehensions—they will see, as others do now, that they are largely fighting shadows of their own creation. And they will discover too that it is sheer madness to make a divinity of the popular will, as expressed by government—the necessarily rude adjustment of conflicting individual wishes and interests, executed by fallible individuals. A government of the people, for the people, by the people, may be the very best government possible for a free people; but to make a god of it, putting upon its shoulders all powers and all responsibilities, in the hope of ushering in the millennium thereby, as socialists threaten, is a scheme worthy only of the madhouse.

THE WEST AS A FIELD FOR MANUFACTURES.

The rapid progress of manufactures westward during recent years has been noticed in this paper frequently. Already the Western markets are to a great extent commanded by Western industry; and the tendency is to make that part of the Union each year more and more independent of the factories of the East and of Europe. Thus far in the competitive struggle two factors have told strongly in favor of the Western manufacturer—nearness to market, and a closer knowledge of and sympathy with the special wants of his customers. There is another factor which promises to help still more the development of the manufacturing industries of the West, a factor which Eastern men have been slow to appreciate; and that is the superior natural facilities of that region, especially the Northwest, arising from the abundance and permanence of its available water power and the even greater abundance of coal. In the SCIENTIFIC AMERICAN SUPPLEMENT Number 140, will be found in full a notable article from the Chicago *Journal of Commerce*, with relation to this matter. The Northwest is shown to be especially rich in rivers affording large and uniform currents and abounding in valuable mill sites. Wisconsin, Minnesota, and Iowa have a score of such rivers furnishing available power equal to that of the most prominent power furnishing rivers of the East. In any of these States can be found rivers like the Des Moines of Iowa, or the Fox of Wisconsin, able to run all the machinery in New England and New York. The force available at Minneapolis alone is estimated at 120,000 horse power. In the three States mentioned, the *Journal* counts fifty rivers from 150 to 600 miles in length, which possess every requisite as first class mill rivers; and each of these has numerous tributaries a hundred miles or less in length, abounding in valuable mill sites; rivers fed by lakes and other natural reservoirs, which supply a strong and almost unvarying current the year round. Besides, owing to the natural advantages of the bed rock of Western mill sites, the average cost of dams and other structures for commanding water power in the West has been only about two thirds that of similar constructions in Eastern States.

The extent to which the water power of the Northwest is already utilized is but imperfectly appreciated even in the West. "In the single industry of the flouring trade," says the *Journal*, "we find its rivers turning the wheels of two thousand of the twenty-five hundred flour and grist mills. A thousand manufactories of agricultural implements and machine shops are already established, and the wagon and furniture factories are legion. Woolen and cotton mills, tack and nail factories, and in fact all the higher grades of manufactories have already discovered the advantages which our rivers offer for their location." The Mississippi valley must ultimately furnish homes for ten times as many people as the whole of the United States now contains. As that time approaches these splendid facilities for manufacturing enterprise will make the Northwest the busiest and wealthiest region in the world. With every new manufactory the need of sending corn and wheat and beef and pork half way round the world to find a market will be lessened, to the farmer's gain and the general advantage of the commonwealth. Indeed the combined advantages of the Northwest, in possessing a fertile soil, abundant mineral wealth, a plenitude of available water power, a healthy climate, and a vigorous and thrifty population, make it, it seems to us, a field for manufacturing and other industrial enterprises second to none in the Union. And the recent emigration to that region of thousands of thrifty mechanics and artisans from the East indicates very plainly that its industrial future is being rapidly determined in the right way.

PNEUMATIC ENGINES FOR STREET CARS.

The substitution of compressed air motors for horse power in street car traffic has for some time been under consideration by the Second Avenue Street Railway Company of this city, and it is now claimed that the prospects of a successful issue are most satisfactory. An experimental car was run over the Harlem portion of the road, August 3d, and behaved so well that the company propose to dispense entirely with horse power on that part of their road as soon as a sufficient number of engines can be constructed. Ultimately they hope, it is said, to extend the improvement to the whole distance from Harlem River to Peck Slip.

Externally the new self-propelling car resembles the ordinary street car, the compressed air reservoirs and other machinery being under the floor and out of sight. In the trial trips a speed of from sixteen to eighteen miles an hour was obtained. The movement of the car is controlled by a brace of levers on the front platform, and involves nothing, it is said, beyond the skill of an ordinary car driver. The capacity of the two reservoirs is sufficient to drive the car from Harlem River to Peck Slip and return. A seventy-five horse power steam engine at Harlem is used to charge the reservoirs, five minutes being sufficient to do the charging. The inventors of this method of propelling street cars are Messrs. Robert Hardie and J. James, of Glasgow, Scotland.

Another compressed air motor for street cars, the invention of Mr. Henry Bushnell, of New Haven, Conn., was successfully tested a few days since in that city. Mr. Bushnell's air receivers are tubes, the largest of which are twenty feet long and only eight inches in diameter (those of the Hardie & James car being two feet in diameter). There are four of these, two on each side of the car above the axles and next the wheels. Between them at the end of the car are four other tubes, each six feet long and six inches in diameter, inside measurement. The double cylinder engine which drives the wheels does not differ materially from a steam engine, except in the smallness of the cylinders, which are only 2¾ inches in diameter. By an ingenious device the cylinders are kept warm by a small air compressor attached to the running gear of the car. Great advantage is claimed by Mr. Bushnell for the long and slender receivers; a pressure of 2,000 lbs. per square inch giving in them a pressure of only 50 tons on the head of each tube, while the two-foot receivers of the Second Avenue car, he says, would have to stand a pressure of 180 tons with the pressure of 800 lbs. to the square inch claimed by the inventor. A gentleman who was present at a trial trip reports that the motion was easy and at times about twice as rapid as that of a horse car. The new vehicle obeyed the engineer promptly in starting and stopping. The distance traveled in going and returning was a little over a mile. At the start the gauge registered 1,800 lbs. At the return the pressure indicated was 1,500 lbs. When the air was allowed to escape from a turned cock the roar was frightful and was as irritating to the ear as escaping steam. In running, however, very little noise is heard from the escape pipe, because the escaping air is made to pass through a mass of ordinary curled hair. This device Mr. Bushnell esteems one of the most important of his inventions. He has no doubt that it would prove equally efficacious in deadening the sound of escaping steam. In running the distance of four miles the pressure was reduced from 1,950 lbs. to 750 lbs.

Whether either of these motors will stand the test of winter use, with snowy or frosty rails, remains to be seen.

A FALSE ALARM.

The New York *Herald* of August 15th set off its regular Washington correspondence with the startling head lines: "*Important Decision of the Attorney General.* THOUSANDS OF PATENTS INVALIDATED." The text of the letter was quite as alarming as its title—to those who did not recognize its absurdity. Fortunately, however, few inventors or patentees are so ignorant of the practical working of the patent system as to be misled by such wild talk about the invalidation of "between forty and fifty thousand live patents." According to the *Herald* writer, the Attorney General's decision is in effect that "letters patent issuing to two or more persons, when but one of them is the real inventor, are void, and cannot be made valid by any act of the parties concerned or by the Patent Office."

The decision is in reality nothing of the sort, the unintentional misstatement of its effect arising from the omission of the words *as joint inventors* after "persons."

The occasion of the decision was this: In 1871 Joseph Barsaloux invented a device for stiffening boot and shoe heels. Before applying for a patent he sold to James & Lyon two-thirds of his right. In 1872 a patent was applied for, and in the application the three men were—"by the misadvice of their attorney and their own ignorance of the law"—described as joint inventors, instead of following the regular practice in such cases of naming the first as inventor and the others as assignees. The patent was issued in accordance with the terms of the application. Subsequently, in 1875, James & Lyon discovered their error and applied for a reissue to Barsaloux alone. In the opinion of the Commissioner of Patents the new patent asked for could not be legally granted, the original patent being void through no fault of the department, and the invention having been in public use for more than two years. His opinion was referred to the Attorney General for an authoritative decision, and the position taken by the Commissioner was sustained in the following terms:

"The error here presented consists of a false suggestion in the original application that the invention was joint. This, whether done through ignorance or by mistake, does not, in my opinion, afford any ground for the action prayed for. The patent issued upon that application must be deemed to be void, as a joint patent cannot be sustained upon a sole invention of one of the patentees (see 1 Mason's C. C. Ref., 473), and the department cannot by means of alterations or corrections confirm or impart validity to a patent which was originally void."

As will be readily seen, this decision imports no new principle or practice into the working of the patent system, and will have no such effect as the *Herald* writer describes. Unless the partners of an inventor have deliberately sworn to a falsehood, claiming to be joint inventors when in truth they were not, they need have no fear of the validity of their patent; and no competent patent attorney would allow such a mistake to occur through inadvertence.

THE WALLINGFORD TORNADO.

On the evening of Friday, August 9, a tornado swept over a portion of the village of Wallingford, Conn., killing outright between twenty and thirty persons, and wounding many more, some of whom have since died. Forty dwelling houses were demolished, besides a church, a school house, a factory, and fifty barns. Nearly all the dead were crushed by falling timbers. The tornado appears to have been confined to a belt of territory less than half a mile wide and two miles long, the whole damage and loss of life occurring on a strip of sand plains of small extent. Severe thunderstorms, in some cases attended with much hail, were general throughout New England that day.

Measured by the loss of life this is by far the most destructive tornado that has been experienced in the East; it was not, however, of unique severity. Some forty years ago the same region, almost the same locality, was swept by a whirlwind of even greater force, though fortunately it did not encounter any human habitations. Still earlier, in 1787, a more fatal and possibly in other respects more destructive tornado struck the country between New Britain and Weathersfield (directly north of Wallingford), and passed on to Eastbury, doing great damage; and it was noticed in the Hartford *Courant* of that time that a previous hurricane had swept substantially the same track, the centers of the two being only 33 yards apart. All these storms occurred in August.

There is a prevalent opinion that violent tornadoes are rare in the East, and that the unobstructed sweep of an open prairie country is needed for their full development. They are more common in the West, it is true; but it is probably due not so much to the more favorable conditions prevailing there as to the fact that the West is very large compared with the East. If equal areas be compared, the Eastern States will probably be found to suffer from whirlwinds as frequently as the West.