Scientific American.

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One Thousand Dollars Reward.

The terms of subscription to our paper are $2 a-year for single copies, but the prices are less where a number of persons combine together and form what is called a Club. Packages of twenty or more subscriptions are supplied at a discount of *thirty per cent.* below the single rates, or $1·40 each, per annum. The allowance of this liberal discount forms a strong inducement, for the simultaneous subscription of several persons in any given neighborhood, and many thousands of names collected in this manner, are annually endorsed upon our books. But in every locality it is necessary, for complete success, that some one or two enterprising individuals should head the movement, or, in other words, "boss the job." They must see to the collection of the money and its remittance to the publishers. They generally re-imburse themselves for the trouble and time spent in making the collections by a percentage in the shape of an increase on the publisher's charge.

It has been our custom, for several years past, to encourage and stimulate the activity of those who undertook the formation of clubs, by offering handsome cash Prizes for the largest lists of subscribers. Last year we paid out $450 for this purpose, but this year we propose to pay more than double that amount. It will be seen by reference to our new Prospectus in another column, that we offer *One Thousand Dollars* for the twelve largest lists of subscribers that are sent in to us between the present time and the first of January, 1857. The following is the manner in which the awards will be made:—

For the largest List,	$200
For the second largest,	$175
For the third largest,	$150
For the fourth largest,	$125
For the fifth largest,	$100
For the sixth largest,	$75
For the seventh largest.	$50
For the eighth largest,	$40
For the ninth largest,	$30
For the tenth largest,	$25
For the eleventh largest.	$20
For the twelfth largest,	$10
	$1000

Here is a grand opportunity for persons of enterprise, young or old, to improve their fortunes. It is the simplest matter in the world to obtain subscriptions to such a paper as ours. Unlike political or partizan sheets, the mere presentation of which is oftentimes repugnant, the SCIENTIFIC AMERICAN *is welcome everywhere.* Its pages are always laden with riches of an intellectual and practical character. No one can examine a single number without feeling that it is suited to his wants, and that he *ought to be* a subscriber. What *ought* to be *will be*, if the canvasser does his duty.

In view of these facts, we confidently hope that the number of SCIENTIFIC AMERICAN Clubs formed this year will be greater than ever before known. The field is a broad one and open to all. Last year the highest prize, $100, was carried off by Canadians, greatly to their credit. This year the first prize is doubled in amount. Let there be a strong and healthy competition in every quarter. Those who work the hardest will get the highest rewards.

One Thousand Dollars, cash, will be paid by us on Jan. 1st, 1857, for the twelve largest lists of subscribers, that are obtained for the SCIENTIFIC AMERICAN. Those whose purpose to compete should begin at once.

On Reading.

Why should so many persons be so very careful with regard to the food with which their bodies are nourished, and pay so little attention to that for the mind? The seeds of disease can be as easily sown in the mind as in the body, and the disease is far more difficult of cure. Every paper and book that is read, exerts a useful or deleterious influence, not only during life but after it. The words and actions that are influenced by books and papers go forth to exert an influence for good or evil upon others, while the food taken into the body is limited in its influence, and that but for a short duration. It is, therefore, of immense importance that every person should be exceedingly careful in the selection of his reading, for in the mass of general reading how little there is of truth, how much of error and untruth. In view of the great amount of unreliable reading in vogue, the question "what is truth," may not only be often asked with propriety, but also "where is truth."

A continual indulgence of the appetite in unhealthy and unsubstantial food will soon enfeeble the body, and make it enervated and effeminate; and it is just the same with reading, which is food for the mind. What then can be expected of those persons whose mental food almost entirely consists of the most trashy literature—its chaff, straw, and stubble? Effeminacy and weakness of intellect. We regret that such a charge can be preferred against the vast majority of our own people, and those of every other enlightened and civilized nation. The records of literature prove that for one reader of real solid and useful papers and books, there are a hundred who feast on the wildest and most frothy works of fiction. Such reading must be injurious to the mind, because it furnishes it with no genuine aliment.

The most useful works in the libraries of the Mechanics' Institutes in England have a very limited number of readers, while those of a light and amusing character have a host. We hope it is not so with the members of our Mechanics' Institutes; and in some instances brought to our knowledge, we are happy to say, it is not. Still, it is the very few among the great mass of our mechanics, artisans, and farmers, especially our young men, who read useful works; the great majority are intense readers of love-sick stories and bombastic fictions.

A man may cram his mind with reading and yet he may be very ignorant and ill-informed. What is knowledge but truth? The man, therefore, who desires to be well-informed (and who does not?) should make truth the object and aim of his reading. Every young man, especially, should endeavor to cultivate habits of judicious reading. He must pursue truth with assiduity if he would store his mind with knowledge; he must endeavor to derive solid pleasure from the study of true and useful works if he would rise to eminence in literature, in politics, in law, in engineering, in chemistry, in any of the sciences or pursuits of life, to be distinguished in which, implies a cultivated mind.

The character of a man is as much indicated by the books and papers which he reads as by the company with which he associates. We have but to know what books and papers a young mechanic, engineer, or artisan reads to form a very sound opinion of his qualifications and his abilities. If he takes no paper or periodical containing useful information relating to science, art, and improvements, he cannot be intelligent; he cannot be expected to attain to distinction in his profession, for he denies his mind that food which is necessary for its proper growth and sustenance.

The Qualifications of Engineers.

The recent steamboat and railroad disasters which have occurred in different parts of our country have called forth a number of criticisms respecting the qualifications of our engineers entrusted with the charge of running steamboats and locomotives, and some of these not very flattering to their reputation. It is to be regretted that too many persons are appointed to the charge of steam engines who are very defective, by want of education and thorough experience, and by defects of character—such as the want of good judgment, care, and decision—to such important trusts. An engineer in charge of a locomotive or steamboat engine is placed in an awfully responsible situation.

For collisions on railroads and steamboats, engineers cannot be justly blamed; conductors, pilots, and captains are the responsible persons for such disasters. But so far as it relates to burnings and explosions in connection with the heat of flues, over-pressure of steam, want of water in boilers, and defects of apparatus and machinery, the engineer is responsible.

What are the qualifications necessary to fit a man for such an important situation? Some have asserted that an engineer should not only be capable of managing, but constructing steam engines, and all their necessary appendages. This is simply preposterous. It is not necessary to be able to construct a ship and all its parts, in order to command and navigate it. Engineers, in general, are machinists, capable of working at the lathe, filing, and fitting up. They are not forgers, molders, or boiler makers, nor is it required that they should be.

An engineer should understand the whole physiology of the steam engine, and be able to take down and fit all its parts together.—He should be a draughtsman; understand the quality of metals; the relative proportions of all parts of an engine, how to work it to the best advantage; and have a most thorough understanding of the nature and action of steam and the construction of steam boilers; and with all the practical and scientific knowledge necessary for his business, he should be intelligent, careful, and decisive. We know one of the most experienced and able locomotive engineers in our country who could not be trusted with running an engine. With all his well-known practical skill and knowledge of the engine, when he used to run a locomotive some years ago on one of the railroads in this State, he was for ever running off the track, or committing some such error. He was sure to be too long in slacking speed before approaching a narrow curve, or a station; and while he could plan, draught, and build locomotives, he was defective in qualities for running one. It is just as necessary to have peculiar qualifications for running as for constructing a steam engine.

It is a fact too generally overlooked, that the most important—because the most dangerous part of a steam engine—is the boiler and its appendages; and engineers, in general do not sufficiently qualify themselves in this department of their business. We would exhort engineers to give more attention to the study of the steam boiler.

Too many explosions are caused by inefficient steam boilers—not supplying a sufficient quantity of steam; hence to raise the proper quantity for a certain speed, it requires tremendous firing and forcing to get the work out of the boilers. It is just like the overtasking of a noble animal in running a race—it must perform so many miles per hour, or be foundered in the attempt. This appears to have been the cause of the late explosion on the steamboat *Empire State.* For such defects of steam machinery the owners must be held responsible. The Coroner's Jury at Fall River, in that case, have exhonorated all parties from blame for this accident. What are the Inspectors for this district going to do? They appear to be very slow in their action; they must he held responsible for it until they have done their whole duty.

Recent American Patents.

Metal Planing.—By Chester Van Horn, of Springfield, Mass.—Consists in a peculiar manner of supporting the cross head or cross slide on which the tool stock is fitted, whereby work of any width may be planed. In the ordinary machines, the width of the work is more limited.

New Drawing Instrument.—By W. J. Kammerhueber, Washington, D. C.—This is an instrument for faciliting the draughtsman in the construction of linear perspectives. It consists in providing the sides of the drawing-board with raised edges of circular form, the sweep of the circle corresponding with the distance of the vanishing point. The lines are drawn with a common T-square, the base or cross piece of which is provided with a couple of pins. The pins rest against one of the circular edges above named, and on being moved around against the circle, the blade of the square will always indicate the correct line of perspective. This simple device takes the place of complicated and expensive mechanism, which has heretofore been required. To artists it will prove a valuable acquisition, as its use will save much time and labor.

Improved Fire Arms.—By Gilbert Smith, of Buttermilk Falls, N. Y.—This invention is applicable to fire arms having the sliding breech and those having the hinged breech, or to almost any that have the breech movable separately from the chamber, and are loaded at the rear of the chamber. It consists in forming a groove around the chamber near the extreme rear thereof, to produce a lip from the solid metal of the rear of the chamber, of sufficient thinness and flexibility to be driven back against the breech by the force of the explosion of the charge, and thereby to prevent any escape of gas, and consequent loss of the force of the explosion. The above is an excellent improvement.

Gold Washer and Amalgamator.—By W. S. Pierce, North Attleborough, Mass.—In this improvement the inventor takes advantage of the well known fact that mercury when heated to a temperature of 212°, will absorb five times more gold than at 60°. The apparatus consists of a large box, in which a furnace for producing the heat is placed. The top of the box is beveled, and covered with an inclined plane or bed, over which the crushed quartz or gold bearing dust, mixed with water, is caused to flow. Ledges or pockets containing mercury are placed across the bed so as to intercept the gold. The fire below heats the mercury, and the precious metal is thus absorbed. At the lower end of the inclined bed is a fine screen, through which the finer particles of gold that may have escaped the mercury, fall. They are received on a sponge, which duly retains them.

Machine for Manufacturing Sheet Metal Ware.—By T. Gomme and C. E. A. Beaugand, of Paris, France.—This invention relates to the manufacture of brass kettles, and utensils of various kinds from sheet metal, without brazing. It consists of a peculiar construction of the stamping punch, one portion of which is made to hold the stamped metal in place during the operation, while the other portion of the punch withdraws for a new stroke.

Improved Odometer.—By Smith Beers, of Naugatuck, Conn.—This is an instrument for indicating the distance traveled by carriages. It consists of a combination of small cog wheels and indexes placed in a box and fastened to some convenient part of the vehicle. There is an elastic connection between the instrument and one of the wheels of the carriage, so arranged that at each revolution of said wheel one of the cog wheels of the apparatus will be moved, and a change of position be thus imparted to all of the others. The instrument exhibits to the eye and keeps an accurate account of the miles and fractions traversed by the vehicle.

Improvement in Paints, Inks, Dyes, etc.—By Frederick Kuhlmann, of Lille, France. The patentee's name is familiar, no doubt, to our readers, and to the scientific world in general. He is one of the most distinguished chemists and savans of Europe. The invention for which he has just secured Letters Patent in this country appears to be one of much practical value; and of universal application in the arts. It consists in the admixture of alkaline silicates with paints, varnishes, inks, dyes, etc. Silicates have heretofore been applied as coatings, or varnishes, or layers, and the colors laid thereupon.

We copy from the patentees specification the following statement of some of the methods of application and advantages of his improvement:

"My invention consists in the application of alkaline silicates, or of several silicates with different bases, to cementing, painting, printing, and dressing or finishing fabrics. The silicate which I prefer using, as being the most economical to prepare when it is applied as a solution, is silicate of potash, which is or may be obtained by heating silica during six or eight hours in a solution of caustic potash having a specific gravity of about 1·160, the temperature being that corresponding with a pressure of five or six atmospheres. Instead of potash I also sometimes use caustic soda, but this latter is more liable to produce white efflorescenses on the painting, especially if the silicious compound be not thoroughly saturated with silica. The vessel which I use for the said preparing operation is a strong cylindrical steam boiler; the silica is kept from the bottom of the boiler by means of a diaphragm of perforated sheet iron, and by using silex or pieces of common gun flint, such as they are found in chalk formations, the calcareous matter adhering to the same having previously been got rod of by washing with dilute muriatic acid, it will be found that the solution is effected without any sediment settling at the bottom of the boiler. When sand is used it will be advisable to employ some mechanical means of stirring or agitating, but I generally prefer using gun flint, either in its native state, or else after having disintegrated the same by chilling it in cold water when red hot. However, all silicious matters may be used and yield solutions that are more or less colorless. The solutions thus obtained are sufficiently thick or dense to be used at once, and it is even necessary to weaken them for very siccative or fast-drying paints or colors; on the contrary, when it is desired to produce a varnish, the solution is still further concentrated. The silicate may also be prepared in the dry process. The operation in this case is carried on in a reverberatory furnace by using one and one-third, or two parts of silica to one part of carbonate of potash, and I heat the whole during six or seven hours till a complete fusion is obtained. This modus operandi may be objected to when used for making solutions for painting, on account of certain sulphurets remaining present, which causes several colors to grow black or dark, but this may be obviated by melting the compound in a crucible, and adding a small portion of nitrate of potash to the mixture of silica and potash.

The solutions of alkaline silicate which form the base of my new or improved paints, are reduced to the proper liquid consistency for being used with the brush, by mixing said solutions with the greater part of mineral colors or pigments, either natural or artificial, that are at present in use; excepting of course those that are altered by the presence of the alkali, as Prussian blue, for instance. Some colors of the same kind are difficult to apply, and require precautions, being rather strongly attacked by the solution of silicate of potash, and by partially combining with silica for instance white lead, chromate of lead, etc. These latter kind of colors must therefore be used with weaker solutions or else in conjunction with substances having a less affinity for silica. It may also be observed that even the more insoluble kind of colors are attacked a little by the silicate; among these we have the artificial or natural sulphate of barytes, which form an exceedingly white and cheap base, and agrees very well with the silicate by thoroughly uniting with it. Although this white base does not cover quite so well as white lead, yet it is preferable on account of the low price at which it can be obtained.

When the improved paints are used, the surface or object to which the paint is applied must sometimes be filled up or cemented, the same as when oil, turpentine, gelatine, starch, etc., is used.

For this purpose I form a cement or mastic from the same solution, which is concentrated for the purpose. and compounded with fast-drying substances, such as white lead, artificial carbonate of barytes, phosphate of lime, chalk, ocher, oxyd of manganese, oxyd of iron, etc., the mixture being applied to the joints.

The silicate colors above described may be rubbed over or smoothed down with pumice stone, they can also be laid on in several layers and covered with a varnish that is made with a dilute solution of the same silicate as has been used for making the paint itself. The silicious paints may not only be applied to stone and wood, but also to metals, glass, and porcelain.

These colors sticking very satisfactorily to metallic substances, ochre and oxyd of manganese, or oxyd of iron and silicate, may be used to preserve the iron from rust, instead of minium (red lead) and linseed oil; also, by applying successive layers of a mixture of silicate and artificial sulphate of barytes, upon brightened surface of cast-iron, a very durable and hard kind of enamel is obtained, that can be vitrified by heat if required. Oxyd of manganese may be used in the same way, and gives a black enamel of a superior description. The silicate colors produce remarkably fine results when applied to glass painting; and the pigments which I chiefly make use of for that purpose, are transparent or opaque enamels, which are reduced to fine powder; all the other colors, and also ordinary gum-lac colors, are equally applicable, but these latter are liable to get changed by the presence of free alkali, and are less solid than mineral colors. I also sometimes form an imitation of dull-ground glass, by applying artificial or natural sulphate of barytes and the soluble silicates on glass, either cold, or vitrifying the same by heat, so as to produce white enamel.

The processes above-described for glass-paintings, are equally applicable to porcelain, which may be ornamented with the varied and elegant colors, either when it is enameled or not, (viscotto); the painting in the latter case, being coated over with silicated varnish or enamel.

In any of the applications above set forth, the varnish or enamel after some time becomes insoluble in water, even if it be boiling; this insolubility may be still further insured by the addition of the coloring oxyds, or of a small quantity of artificial carbonate of barytes, which is dissolved in it at a gentle heat. In some cases when the colors are not very siccative, they may be rendered more insoluble by washing the painting after it has hardened, with a dilute solution of hydro-fluo silicic acid, which fixes the potash—however, this means need but very seldom be resorted to.

The paintings may be made still more insoluble by washing them with a solution of muriate of ammonia. My new black colors, or pigments, which are made with lampblack, are as homogeneous or mix as well as the others. In these colors there is no danger of a double silicate forming; it will also be found useful to increase the drying powers of the silicate, by adding a little artificial carbonate of barytes. The same precautions may be taken with respect to other colors, that are not very liable to be attacked by the alkaline silicate. These black colors may also be used as printer's ink, giving a very fine and durable letter press. As the silicated ink, however, is liable to get thick soon under the roller, a little treacle may be mixed with it, to facilitate the work. Instead of black colors, any others may equally be applied to paper; also, by printing a colorless and concentrated solution on the paper, I prepare the same for gilding or silvering, or the silicious solution may be used for fixing on paper and other surfaces, thin leaves of metal, which are previously rendered adhesive, merely by slightly damping them with saliva or some other gummy liquid. The processes described with regard to letter-press printing, are also applicable with regard to the manufacture of papers for hanging rooms, etc. The same means and processes may also be applied to fixing on fabrics, certain adjective colors, such as ultra-marine, and for printing on fabrics any lac-colors of organic origin, which give tolerably solid designs. The colors may be fixed by using, in suitable proportions, any of the above substances employed for rendering the silicated *paintin* insoluble, or any salt that decomposes the silicate, that is still soluble, answers the same purpose. The silicious solutions can be also employed as the base of a most unalterable writing ink. For this purpose, I prepare a liquid of a brownish-black, by boiling pieces of old leather with a solution of caustic soda or potash, and this alkaline solution is then saturated with silica that is in a state of jelly, and if a deeper black is to be given to the ink, the carbonaceous ingredients of Indian ink must be added.'

Recent Foreign Inventions.

Reworking Waste Fiber of Cloth.—S. C. Lister, of York, Eng., has secured a patent for reducing hard waste fiber with a twist in it, like cord, or woven cloth of cotton, silk, &c., to be worked over again. The waste is first cut in a machine into short lengths, then it is put into a machine having revolving arms, like a rotary flail, and beat for some time. This loosens the several strands in the same manner that plasterers loosen the hair used to mix with their first coat for walls.—After this beating it is placed in a chamber and exposed to the action of steam, then taken out, dried, and submitted to the action of the common carding engine of a cotton factory. This process is stated to be a great improvement in the way of treating shoddy, or waste cotton twists, to be reworked and put into new fabrics.

New Lubricating Compound.—H. Hyde, of Nova Scotia, patentee. Take 100 gallons of clear coal oil, and 7 lbs. of india rubber; heat to a temperature of 150° Fah., and agitate them from time to time for several days, until the india rubber is dissolved. The liquid is then passed through a fine seive into a vessel, where it is suffered to remain several days, when it becomes perfectly clear, and is fit for use. For most purposes this will make a good lubricating oil; but it has been used for many years in various parts of the United States.

Hollow Iron Spikes.—C. May and P. Prince, Eng., patentees.—This invention consists in the manufacture of hollow iron spikes or tree-nails. The portion of the spike at the head is made thicker than the point; the point is stated to be made in the shape of a quill, to be driven into wood without a hole being bored for the purpose.

New Glass.—In making common transparent glass, some potash and soda are generally employed as fluxes for the silica, but L. I. F. Margueritte, of Paris, has obtained a patent for dispensing with these in making transparent glass, by the use of silica, lime and albumen alone. By calcining a mixture of silica 65·47 parts, lime 25·80, and albumen 8·73 parts, a perfectly transparent glass, is stated, can be manufactured.

If these ingredients produce a good transparent glass the discovery is a valuable one.

Hydrogen Gas for Locomotives.—H. Wickens, of London, has secured a patent for improvements in locomotives, one of which consists in placing retorts in the furnace in such a position that they can be easily fed, with iron filings, and as easily emptied. A pipe in connection with the boiler admits steam to these retorts, and as the iron filings are kept red hot, they will decompose the steam by depriving it of its oxygen, setting its hydrogen free (water is composed of hydrogen and oxygen.) Another pipe allows the hydrogen to pass into the furnace where it is ignited and mixes with the products of combustion to produce an intense heat. Although hydrogen gas produces but a feeble light, it gives out a most intense heat when ignited; still, it appears to us that, as much heat must be absorbed in the furnace by decomposing the steam to produce the hydrogen, as will be gained in the liberating of hydrogen in the furnace. This, however, is a question to be determined by experiment alone. Steam has been introduced into furnaces for the purpose of producing a greater degree of heat, by resolving it into its elementary gases, and the great objections to its use has been stated to be a rapid oxydation of the grate bars and sides of the furnaces; the plan of Mr. Wickens removes this objection or evil, but not at less cost, we presume, taking into consideration the wear and tear of the retorts, &c.

Epidemics.—Yellow Fever.—Its Cause.

The discovery of the cause of any epidemic would be of vast importance, for "a pestilence that flyeth by night and walketh at noonday" is a terrible visitation to any community. Although volumes have been written on epidemics, their causes are still veiled in much doubt and obscurity.

Some of our Philadelphia cotemporaries, especially the *United States Gazette*, have recently published some good articles on the causes of cholera and yellow fever, still, they contain too much that is indefinite.

Of late years the cholera and the yellow fever have been the most appalling epidemics with which our country has been visited. The latter is a fever which appears to have its origin in the West Indies, South America, and in some parts of our Southern States, and is chiefly confined to those regions. Local causes no doubt, give it the peculiar character for which it is distinguished. If these were known, the question arises, can they be removed.

The *U. S. Gazette* says:—"The localities of yellow fever have been described, and the features which they possess in common have been noted. There are, in a great many places, a mixture of sea and land air, maritime exposure, a hot and moist air, low ground, marshes, swamps, vegetable and animal remains in a state of decomposition, and a mixture of this product with the human or vegetable mold, forming made ground, with scattered materials on the surface directly exposed to the operation of the sun and air at a high temperature. This is a description of the localities also of those fevers, intermittent and remittent, with which we are so familiar, and which are sometimes designated by the title of marsh or paludal, after their ordinary locality, also of periodical or intermittent, and, finally, miasmatic or malarious, from their presumed origin in miasma, generated in the soil by the action of hot and moist air."

This paragraph is somewhat confused, bu it points to one cause of yellow fever distinctly, viz., exposure of upturned new soil, and this apparently has some foundation in fact.

Dr. Barton has stated that from 1796 to the present date there has been no great epidemic of yellow fever in New Orleans without an extensive breaking up of the soil, such as digging canals and basins, or excavating the streets. Dr. Levert, of Mobile, traces epidemic yellow fever in that city to similar disturbances of the soil, and in Charlestown, S. C., such works are forbidden during hot weather. In 1795, during the yellow fever in New York, it prevailed most extensively (as stated by Dr. Bayley,) and was most fatal in situations where the ground was *new made.* There can be no doubt, we think, but that new made ground exposed in hot weather tends to cause fevers. In all the new countries West, intermittent fevers and fever and ague are most prevalent during the season succeeding the first breaking up of extensive tracks of new soil in spring. A useful lesson to be derived from these facts is, that the plowing up of extensive tracts of new land should always be performed in the fall season, and that extensive excavations and exposure of much fresh soil should never be permitted in cities during very hot and moist weather.

The breaking up of new land or excavations, however, will not account for all epidemic yellow fever, for its prevails, more or less, every season, in some part of the intertropical regions of our continent. It is a disease which is asserted to be infectious by some, and denied to be so by others. It will visit a place one season, then after a certain period disappear, and perhaps not return again for a number of years, and perhaps never. It prevailed fatally and extensively in Norfolk and Portsmouth, Va., in 1855, when there were no extensive excavations carried on, while this summer these cities have been comparatively healthy. Some persons asserted that the yellow fever as an epidemic traveled in circuits, and that from New Orleans it was traveling around the cities of our Atlantic coast, and would visit Philadelphia and New York this summer; but these predictions have not been verified by facts, for the city of New York—although it never experienced a hotter summer—never was healthier; no epidemic in any form has yet visited it. Some cases have occurred at the Quarantine Hospital at Staten Island, brought in by ships from Havana, and some such occur in the same place almost every summer, but no epidemic has made its appearance.

Fire-Engine Playing.

The Adrian (Mich.) *Watch Tower* states that "Albert" engine, No. 1, of that place, threw a stream out of a 7-8 inch nozzle on the 1st of August, to the distance of 238 feet 2 inches horizontally. In all accounts of horizontal playing with fire-engines, the hight at which the pipe was held should be given. The nozzle should be laid on a board perfectly true, as the elevation of it a single inch makes quite a difference in the measured length to which the stream is thrown.