Correspondence.

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

The Young Machinist Once More.

To the Editor of the Scientific American:

I noticed an article signed "A Young Machinist" on page 20, volume XXVII, saying that he was glad he learned a trade; but it would seem from his talk that he was sorry he did not learn the right one. It seems he is one of those who think no man should be allowed to run a locomotive unless he was a machinist. Now I think there are greater qualifications than that. No man, not even a machinist, can face off valves or build boilers on the road, and make his time. An engine must go into the shop for repairs, even if the engineer be a machinist. From his communication, it would seem that he believes that the companies take men right off the street, who know nothing about grades, running just fast enough and not too fast, nothing about fire, water, or making time and keeping out of the way of other trains. I am not a railroad man now, but some time ago I was fireman for nearly two years. We were on a branch road away from the shop. The man I fired for served six years as fireman, which was the average time on that road; and he did not have his engine in the shop but once and that was for a broken tire. What machinist could have done better? But there was more than this. Twice it seemed as though we were rushing to instant death, and, although his face was white, he showed no sign of fear but stood to his post like a man and brought his train out in safety. After we left that road, there was an engineer put on who was a machinist, a good man to repair engines, etc. One day, he was passing out of a station with a passenger train, running perhaps six or eight miles an hour around the first curve, when he met a freight train coming in; and without calling for brakes, without reversing his engine, without even shutting off steam, he took the leap and left his train to its fate, although had he stood at his post no accident could have happened, as the freight train was stopped when they came together. The engines were damaged and some of the passengers injured, although none fatally. Which of the men was the best engineer? Which the safest for the public or Congress to trust their lives with?

I clip the following from the *Brotherhood of Locomotive Engineers' Monthly Journal*:

"Now take two young men, each 21 years of age. One has served his time at turning tires, boring out cylinders, facing valves, and other work necessary for the building and repair of engines. The other has fired the usual time under the eye of some careful engineer, and has become familiar with the locomotive and railroading in all its various forms, has been on the engine in rain, snow, dew, fogs, in warm and cold weather, by day and by night, up hill and down, through the forest and over the open plain. He has seen the engineer overcome all the difficulties that are apt to occur; he has assisted him to take down and put up every part of his engine; he has been with the locomotive in all its vicissitudes: he has, by constant use and observation, learned how tires should be turned, valves faced, etc., and now he is declared master of his trade. And now they stand side by side, each one ready to compete for the championship of the iron monster. Now take the difference in the two men. The former one has not been accustomed to move his iron steed; he knows nothing of railroading and its ups and downs. In the latter, the locomotive has been his protégé, and he has traveled miles enough by it to carry him many times around the globe. And now I ask all manner of men: Which train are you going to take? Husbands and fathers, in whose care will you trust your wives and little ones to be whirled away into the midnight darkness?"

I do not wish it to be inferred that I think a machinist cannot be an engineer, for such knowledge would be a help to him; but I think they are two different trades, and I do not like to see a man of one trade call a man of another an "ignorant wretch" because he gets more pay than himself, or because he does not understand another trade than his own in all its details. ALECK.

Waterbury, Conn.

A Question in Architecture.

To the Editor of the Scientific American:

The county Board of Supervisors of this (Dickinson) county is rebuilding the court house of bricks which were in the walls of the original building burned last fall. The walls were then blown down by the wind. The bricks were cleaned off and relaid into a wall the second time, which was also blown down when it had got up to the middle or the second story windows or thereabouts. The bricks were then recleaned; again the wall was relaid with the same bricks, the inner course being filled up with pieces of brick. This wall for the court house and public offices is 30 x 50 feet on the ground, the partition walls being all lath and plaster. The wall is 24 feet high and only 12 inches thick from bottom to top; the former wall which was burned was 20 inches thick below and 16 above.

This building stands on the highest elevation, probably, in the State, with not a tree or shrub for miles to break the force of the terrible winds which sweep over our prairies. Now I contend that these walls are not safe, but, on the contrary, are a perfect mantrap and will probably kill somebody. What is your opinion? T. S. SEYMOUR.

Milford, Iowa.

[This is not surprising in view of the mania at the West for thin walls. No amount of experience in the disastrous results from weak structures seems adequate to insure stronger buildings. The thoroughness of the destruction of Chicago was owing in no small degree to a deficiency of the thickness of the walls. Party walls 8 inches thick were quite common there, and some were only four inches. Very few of the walls stood after the timber was burned so as to fall to the cellar. There was not sufficient substance in the walls to stand alone. They depended upon the timber for support; and as soon as this support was removed, the walls fell, leaving an open field for the flames. Chicago was essentially a *wooden* city, although apparently built with brick.

Buildings, to be durable, should have walls strong enough to stand alone. The walls of the court house above referred to, 50 feet long, unsupported with cross walls at any intermediate point, ought to be two feet thick in the principal story and twenty inches thence to the roof; and they should be built with new, hard, whole bricks well bedded in a sufficiency of best mortar. Built in this way, their stability would be unquestionable. But built as above described, the builders would have continuous employment in restoring them after each storm of wind.—EDS.

Estimating the Distance of a Lightning Stroke.

To the Editor of the Scientific American:

During the great thunder and lightning storm in Philadelphia, in the evening of July 4 last, frequent discussions arose in regard to the probable distance of thunder and the velocity of sound in air. Some maintained that sound travels over a mile per second, and others said that the velocity of light must be considered in estimating the distance of the thunder, all their opinions varying greatly from established facts in physics, for which reason I propose to send you a table on that subject, which you may consider worthy of publication in the SCIENTIFIC AMERICAN.

DISTANCES IN FEET WHICH SOUND TRAVELS IN AIR.

Time of travel.	Temperature of the air, Fahr. 50°.	60°.	70°.	80°.	90°.
Seconds	Feet.	Feet.	Feet.	Feet.	Feet.
1	1,109·6	1,120·6	1,131·1	1,142·5	1 153·2
2	2,219·2	2,241·2	2,262·2	2,885·0	2,306·4
3	3,328·8	3,361·8	3,393·3	3,427·5	3,459·6
4	4,438·4	4,482·4	4,524·4	4,570·0	4,612·8
5	5,548·0	5,603·0	5,655·5	5,712·5	5,766·0
6	6,657·6	6,723·6	6,786·6	6,855·0	6,919·2
7	7,767·2	7,844·2	7,917·7	7,997·5	8,072·4
8	8,876·8	8,964·8	9,048·8	9,140·0	9,225·6
9	9,986·4	1,008·5	1,018·0	1,028·2	1,037·9
10	1,109·6	1,120·6	1,131·1	1,142·5	1,153·2

The velocity of lightning is probably not less than the conduction of electricity through the best conductors, or about 200,000 miles per second, and the time occupied for only a few miles is so small that it could not be appreciated or recorded without extraordinary instruments for that purpose, for which reason it is disregarded in approximating the distance of thunder.

The occurrence of a lightning flash cannot be anticipated, and we are therefore generally unprepared to record the exact moment, which frequently comes unexpectedly, when no appropriate time keeper is at hand. In a room where the beats of a clock's pendulum can be heard or seen, it is easy to count the beats between the lightning and the thunder, by which the time can be approximated. With some practice, the beats of seconds can be counted with tolerable correctness without the aid of a time keeper, which practice has been of great service to me in astronomical observations. We should practice counting seconds with the second hand of a watch until the countings agree, without looking at the time keeper for a minute or two. The counting should not differ more than one second in a minute, by which means the time between the lightning and the hearing of the thunder can be closely approximated.

In observing the altitude of the sun or lunar distances, at sea, it is customary to keep a watch ready in the hand, or to station an assistant at the chronometer to note the time when the observer says "Stop;" but there are known cases when the captain has taken observations without a watch or assistant, and walked slowly and comfortably to his cabin and noted the time of his observation from the chronometer, with no little amusement to the mates and others, who naturally supposed that the captain's observation could not be very correct; but to their surprise it was found to be as correct as their observations with ordinary precautions. The fact was that the captain counted in his mind the beats of seconds, and deducted the sum from the time observed on the chronometer.

I have made a great many astronomical observations of different kinds in the interior of South America, particularly of eclipses of Jupiter's satellites; but when I have no instrument connected with the telescope for the purpose of recording time, I have never attempted to note the time of observation directly, but counted the beats of seconds and turned myself comfortably to the chronometer and deducted the counting, which generally amounted to four or five seconds The practice of counting seconds correctly is very useful in a great variety of cases. In actions of very short duration, say less than three seconds, it is best to count half seconds, or even four times in a second, and the time may be determined with a correctness to less than a quarter of a second.

JOHN W. NYSTROM.

Capacity of the Boston Coliseum.

To the Editor of the Scientific American:

The Coliseum was estimated by the Boston newspapers as capable of seating an audience of from eighty to a hundred and twenty thousand, besides a chorus and orchestra of twenty to thirty thousand; so that averages of "half houses" were expected to be sufficient to yield immense profits. The houses, however, averaged three quarters full and yet money was lost.

Now for the explanation by feet and inches. According to the lithographed plans of the building, the entire seating capacity of the auditorium was less than 17,000 persons, and that of the orchestra and chorus less than 12 000. Deducting the obstructions of posts and stairways a maximum of 28.000 persons might have been seated at one time, of whom 16,500 might be classed as audience. At no time was the number of persons standing at the concerts greater than the number of empty seats, and certainly the "deadheads" numbered 2,500, so that it were unfair to estimate for more than 14,000 paid tickets for a full house, or for an average exceeding 9,500 paid tickets to all the concerts. This, if substantially correct, accounts for the failure financially.

The space under the galleries was almost entirely occupied as reception rooms, offices and passage ways, so that we have only to deduct, from the total of some 200,000 square feet of surface, the rather small estimate of 50,000 square feet of stairways and passages, not under the galleries, and divide the remainder by the five feet which a person sitting requires. This gives a maximum capacity of 30,000 persons, and is quite near enough to prove the substantial correctness of the previous figures. B.

Demoralization by Leisure.

To the Editor of the Scientific American:

The article in your issue of July 21st, credited to the *Christian Union*, seems to me to demand some notice, as, I think, it contains more absurdities than I have ever before seen in the same space. The world would be much better off if every human being, who has the strength, would work from one to ten hours per day, as circumstances required, at some useful and productive employment. Mental strength can only be maintained by a proper amount of physical exercise, and it is far better that this should be useful than useless. When all do their part, an average of five or six hours' labor per day will supply all our wants, relieve the overworked, strengthen those who need it, banish sickness, and leave plenty of time for mental improvement and recreation. The "leisured class," with exceptions as rare as angels' visits, are worse than useless. For proof I point you to the aristocracy-cursed nations of the old world. The more society has of this class, the worse it is off, for the mere laborer sinks into a condition of stolid ignorance and brutality, while the "leisured class" plunges into a gilded debauchery, destructive of every good principle.

Society owes everything to labor, mental and physical; nothing to the "leisured class."

A pampered bigot may charge upon our Heavenly Father the inequalities caused by man's injustice, but such blasphemy can never emanate from the brain of any true Christian.

I could fill volumes with the sins and shortcomings of this so called "leisured class," but will only mention one or two. They make a mock of marriage; they tempt thousands, who would otherwise be ornaments to society, to a life of shame; and, after the poor victim has spent the best portion of life in pandering to their base passions, and a fresh one is wanted, she is turned into the street to sow the seeds of moral and physical pollution among the laboring classes. But enough of this. I am very glad to find a grain of sense and truth, at last, where he says: "The safety and progress of humanity, as a whole, depends on each man's serving faithfully;" but if he expects it to be done without murmuring, he expects too much. Where but little is given, but little is required, and the reverse.

I am a working man, but I believe all strikes, however they may terminate, injurious to the working classes, and I may give my reasons some day, when I have leisure, through the SCIENTIFIC. J. E. S.

Portland, Me.

The Underground Railway in Baltimore.

To the Editor of the Scientific American:

With all the advantages of education, engineers of public works appear to be at fault at times. The Potomac tunnel, now being constructed under one of our streets, passes through a variety of soils and, in some places, through solid rock. At first no counter arches were built on the soft clay soil; hence the great weight of superstructure and filling on top to line of strut was too great for the soft clay foundation, causing the whole superstructure to sink, throwing the clay up in the roadway. Of course there was nothing left but for the engineers to have counter arches built on all such soil.

A common observer would have supposed that, had they ever engineered a similar work, they would not have risked this one without the counter arches.

Baltimore, Md. J. W. L.

How to Destroy Wigglers.

To the Editor of the Scientific American:

I have a number of water barrels around my outbuildings, besides a cistern. The water in the barrels suits best to water plants, being warmer than cistern water.

But the wigglers breed in it by thousands. I have been trying to destroy them, and have found out what will kill every one in an hour. Pour a few drops of burning oil upon the water, sufficient to cover the surface; stir a little to be sure of completely doing this, and draw off the water below. Add oil if anything disturbs the covering. It has answered well with me.

Cleveland, O. W. WARD.

AT the recent exhibition of the Royal Agricultural Society Cardiff, Wales, an eight horse portable engine, made by Clayton & Shuttleworth, worked for five hours under a consumption of 2·92 lbs. of coal per horse power per hour—an unparalleled result for a non-condensing engine.

Small Fast Steam Propellers Again.

To the Editor of the Scientific American:

A plain working man, laboring 60 hours in the week, with but one day in that time to call his own, I had not expected, in publishing an article in your valuable paper on this subject, to provoke a correspondence from nearly every State in the Union, making enquiries how such a vessel can be procured, how she should be constructed, her cost, etc. At the risk of repetition, I will ask your kind assent to reply to these correspondents through your valuable paper. The boat described before is 50 feet long, 45 of which is hull and 5 feet of it overhang at the stern, beneath which the propeller is placed. She has a forecastle deck of about the same size (5 feet), is 7 feet beam, and 54 inches depth of hold. She is built of oak by a common house carpenter who had worked on canal boats in the State of New York. The stern and stern posts are very heavy and strong, as are the floor and side timbers, all well ironed, and as staunch as could be made. The hull is flat bottomed and a foot narrower at the bottom. A deck 40 feet long, 8 feet high from the bottom floor, protects the machinery and passengers from the weather. The vessel is propelled by a screw wheel having four fan-shaped blades 2 feet long, and 2 feet wide in the widest part, bolted to a wrought iron hub with flanges set at an angle of 45° with the shaft. The machinery has already been described. The whole cost of this boat has been about $1,500; and for general jobbing, towing, and pushing rafts, or work where speed is needed, she is better worth the money than many boats which cost four or six times as much.

We are indebted to your valuable paper for much information which has aided us in making this boat a success. Without any previous experience in building such craft, we found by reading the English article you published that the wheel was too large for the power. By cutting out one third of the filling, making the blades 2 feet wide instead of 3 feet, we took one third the labor off the machinery, and gave fully that much or more speed to the vessel.

In the former article, I said she would carry 20 or 30 passengers. On July 4th, the engineer had a benefit by going short excursions, and as her speed had attracted public attention she was crowded all day. She carried 46 passengers with perfect safety, and only seemed to run faster for being so heavily loaded. That day she repeatedly made a mile in 4 minutes, and in calm weather she regularly crosses the river, five eighths of a mile, in 2 minutes and 40 seconds. Her economy of fuel is remarkable, burning only 10 bushels of rather poor soft coal a day; and her entire crew consists of one man, who manages her with perfect ease and safety, the steering wheel being close to the engine, and everything very convenient.

As quite a number of your readers appear to want a boat of this sort, there are doubtless competent draftsmen in New York who would furnish complete drawings to build by. The circular slide valves are used on the engines of this boat with great success. J. A. G.

Force of Falling Bodies.

To the Editor of the Scientific American:

Since you are publishing a series of articles on "Weight, Pressure, Power, Force," etc., it would be useful to so explain the acting force of a body in motion, its momentum or striking force, that, if such a thing be possible, your readers may understand what it means, by what it is measured, and how determined.

While this is one of the simplest problems in physics, as well as one of the most essentially practical, it is one of those of which the majority of the people are most profoundly ignorant, as is shown by the frequent questions on the subject in your valuable paper, and by the replies, no two of which are alike, and which indicate that the correspondents are hopelessly befogged.

In your number of July 6, page 10, a correspondent—misled by Haswell probably—estimates the force of the hammer, weighing three tuns and falling four feet, at over 160,000 lbs. But what does he mean? What is a pound of force? To what is it equal? What work will it do? He does not say foot pounds, and if he means that, he is wide of the mark in his estimate. A blow cannot be compared with weight or pressure alone.

It should be universally known, if possible, that force is estimated by the measure of the work it is competent to perform, the number of pounds it will raise one foot high. The force which will lift one pound one foot is called a foot pound, and is the unit used to express the amount of a force. Gravitation, being a constant quantity, is a convenient standard, and force measured by the amount of gravitation it will overcome affords a statement quite intelligible to any intelligent person. Next, it should be known that this same one pound, in falling freely one foot, will accumulate the same amount of force, that is, gravity will impart to it in its descent the same amount of force which it took from it in its ascent, and therefore the force of the blow will be just one foot pound; and, if converted into heat, would produce exactly the amount of heat which would be required to lift the one pound one foot high again.

In general, the force with which any falling body will strike is precisely the amount required to lift the same body to the hight from which it fell. When, therefore, the weight and hight are given, their product is the force of the blow in foot pounds, and, in the case of this hammer, would be 6,000 × 4 = 24,000 foot pounds. The force of a "weight of one pound falling two feet" would be 1 × 2 = 2 foot pounds, while Haswell's "Engineers' and Mechanics' Pocket Book," page 419, gives it at 11·34 lbs., whatever that may mean.

If the velocity is given, we find the hight as follows: Dividing the velocity by $32\frac{1}{6}$ (the velocity acquired in each second) gives the time of fall in seconds, and multiplying the square of the time by $16\frac{1}{12}$, we have the hight from which the body must have fallen to acquire the given velocity, which, of course, is also the hight to which the body would ascend, if projected upward with the same initial velocity before its force would be expended in overcoming gravitation. Obviously, the force of the blow will be the same, with the same velocity, whether the motion be downward, upward, or horizontal; hence, to find the force with which it is moving, we only require to find the hight from which a body must fall to acquire the given velocity, and said hight, multiplied by the weight, gives the striking force in foot pounds, or the amount of work the body would perform, the resistance it would overcome, the weight it would lift one foot, or the heat it would produce; and also, what is the same thing, we have the amount of force expended in imparting to the body the given velocity.

The general confusion of ideas upon this subject is probably largely due to the fact that the text books differ widely, and the majority of them are entirely wrong, as they almost all teach that the striking force is proportional to the velocity, whereas it is, in fact, proportional to the square of the velocity, as is readily shown by the law of falling bodies enunciated in the very same books.

The formula above given is far more simple than the various arbitrary and fantastic ones so often presented by your correspondents, and has the peculiarity of being correct, and consequently consistent with all the laws of motion; and if you will give me space for a few examples, I believe its application will be perfectly plain to your readers. Instead of dividing the velocity by 32·16 and multiplying the square of the quotient by 16·08, we may, of course, obtain the same result by the shorter process of dividing the velocity by 8·02, and squaring the quotient.

1. A one pound ball moves 1,000 feet per second; $(1,000 \div 8{\cdot}02)^2 = 15,545$. Its force then is 15,545 foot pounds, and as it weighs one pound, if its motion were directly upward it would mount to the hight of 15,545 feet, and on returning would acquire in its descent the same velocity of 1,000 feet. The force expended, then, in imparting this velocity was equivalent to that required to raise 15,545 pounds one foot.

2. A twenty-four pound ball has a velocity of 50 feet per second; $(50 \div 8{\cdot}02)^2 \times 24 = 931{\cdot}44$ foot pounds. If this twenty-four pound weight were a hammer with a stroke of 38·81 feet, it would acquire a velocity of 50 feet, and would strike with a force of 38·81 × 24 = 931·44 foot pounds, and this amount of force, in any available form or mode of manifestation, would be sufficient to impart a velocity of 50 feet to a mass of 24 pounds, or to lift 24 pounds 38·81 feet, or to lift or throw one pound 931·44 feet high, or 931·44 pounds one foot high. In these calculations, there is no allowance made for atmospheric resistance. W. H. PRATT.

Davenport, Iowa.

Novel Experiment by Tyndall.---Ignition of Diamonds by the Electric Lamp.

In a recent lecture before the Royal Institution, Professor Tyndall said:—

Most of you know that wonderful prediction made by Newton respecting the diamond; his powerful mind, antedating the discoveries of modern chemistry, pronounced it to be an unctuous or combustible substance. We now know that the diamond, beautifully transparent, highly refractive as it is, is identical in its composition with charcoal, graphite, or plumbago.

A diamond is pure carbon, and when burnt as I am about to burn it, yields the same products as carbon would if burnt in the same way. I have a diamond held fast in a loop of platinum wire; I heat it to redness in this hydrogen flame, and then plunge it into this glass globe containing oxygen. The glow, which before was barely perceptible, extends and becomes brighter as you see. The diamond would go on burning in that quiet way until totally consumed, if the supply of oxygen were kept up. In ordinary air, the diamond will not burn; the oxygen is too much diluted by the nitrogen; its atoms are too few in number to carry on an effective attack, but when concentrated, each of the atomic projectiles is assisted by its neighbor, and as it strikes the surface of the diamond, its motion of translation is arrested and converted into the motion which we term heat, and the heat thus produced is so intense that the crystalline carbon is kept at nearly a white heat, so that the atoms of carbon and those of oxygen unite, and carbonic acid gas is produced.

Faraday describes the combustion of the diamond in oxygen, the necessary initial temperature having been derived from the rays of the sun. The experiment is described in the admirable life and letters of Faraday, by Dr. Bence Jones.

This experiment, he describes as being quite new to him, and as never having been seen before. I hope to show you an experiment of a similar character which has never been seen before—the ignition of the diamond by the concentrated rays of heat from our domestic sun, the electric lamp. In order to prevent chilling from currents of air, I have taken the precaution of surrounding the back of the diamond with a hood of platinum wire.

I now insert the diamond in the focus of the electric beam, and in a few moments the diamond becomes very hot. I think that will do. I now plunge it in the oxygen. There it glows, and so it would continue to glow, and would burn away just like coke, also leaving the same residue behind. In both cases the particles of oxygen impinge upon the carbon, grasp its molecules, and convert them into carbonic acid.

I made reference to the luminosity of flame proceeding from the presence of incandescent solid particles of carbon. An experiment has been devised by Mr. Cottrell which illustrates this, and as it is his experiment I will allow him to perform it.

He will fill this globe with oxygen from the iron bottle by displacement in the usual way. That being done, he now ignites a piece of boxwood charcoal, attached to the cap of the globe by a stout wire, and immerses it in the gas; it of course burns with those beautiful scintillations you have so often seen in this room. But instead of allowing this beautiful combustion to proceed as it is now doing, he directs upon the charcoal a jet from the bottle of compressed gas, the consequence being that the combustion is marvellously enhanced, and, from the currents created by the rush of the gas, the particles of ignited carbon revolve in perpetual orbits, at a little distance producing all the effect of a magnificently brilliant white flame. It is my firm conviction that the constituents of ordinary flame to which we owe its light are mainly these solid particles of carbon; though I must also state that a very distinguished friend of mine holds a different opinion.

My intelligent assistant, Mr. Cottrell, some little time ago arranged two circular gas jets of small bore, so that they should impinge directly the one upon the other; the two flames became blended into a horseshoe form, the extremities of which were spirals, and these spirals perpetually threw off particles of solid carbon. I take this as being another proof of the correctness of Sir Humphrey Davy's old notion that the luminosity of flame was due to the incandescence of some part of the matter which was burning.

Mosquito Manure--A Summer Yarn.

Nature has her compensations. At Stratford, Conn., where the mosquitoes are as thick as a fog, lives an ingenious Yankee, so they say, believe it who may, who puts these insects to profitable uses. He has invented a large revolving scoop net, covered with lace, which is put in motion by a windmill, water power, or steam. The lower half of the scoop is placed in water. The upper half moves through the atmosphere and at each rotation draws immense numbers of the 'squitoes down into the water, where they drown and sink to the bottom. Every revolution of the net draws in an ounce of mosquitoes, or a tun for thirty-two thousand turns of the machine. The mosquitoes thus collected make a splendid manure for the land, worth forty-five dollars a tun.

We know that other insects—the cochineal for example—constitute most valuable articles of merchandize; and it may be that this Stratford mosquito manure will yet become a standard article of commerce. The possibility of making mosquito sirups, glues, dyes, and other goods, from the insect mass, remains the subject for experiment.

Patent Infringement Case.

United States Circuit Court—District of Massachusetts, in Equity.

Alzirus Brown *versus* J. R. Whittemore and others.

This was a case of alleged infringement of the complainant's patent, applied for June 1, 1858, issued in October of that year, and reissued June 16, 1868. The case was argued on the specification of the reissue, which, taken with the drawing and model, shows an improved horse rake for raking hay and grain, in which the wire teeth are coiled round a rake head which is hinged to the rear ends of the shafts, just above and parallel with the axle; this rake head is connected with two levers and treadles which enable the operator to raise the rake with his right foot and to hold it down with his left; a handle is attached to one of these levers to work the same effect by hand. The second claim is for the combination and relative arrangement of the hinged rake head with the supporting axle and carrying wheels, whereby the head is supported above the rear upper edge of the axle; and the lower ends of the teeth, when gathering the hay, occupy positions in rear of the tread of the wheels and forward of a vertical plane on a line with the rear edge of the wheels; and the fourth claim is for the arrangement of the rake head and foot treadles, or either of them, in relation to each other and the axle.

In the opinion delivered by Lowell, circuit judge, the court held that a horse rake made and sold by the defendants came within the claims stated, unless they were construed very narrowly. The defendant's position was that in view of earlier inventions the claimant must either submit to such a limited construction or his claims were void; but they failed to show that the patentee himself, or any one else, had made the particular combination so early as to defeat these claims, if construed according to their plain and obvious meaning; and it was held by the court that there was, therefore, no occasion to restrain them to mean only a rake head hinged to the shafts in the precise way shown by the patent. In the plaintiff's rake, the hinges are attached to the outward lower corner of the rake head, and in the defendant's, to the upper inward corner. It was insisted by the defendants that this feature in the plaintiff's patented machine was the only one in which it differed from its predecessors, but it was shown in evidence that the relative position of the several parts, which is new, is attained and is useful whether the hinges are placed on the upper or lower edge of the rake head.

The opinion of the court was that the two claims were valid and were infringed by the defendants.

Decree for the complainant.

Thos. H. Dodge, Esq., for complainant; Chauncy Smith, Esq., for respondents.

A RAILWAY BRIDGE ELEVEN HUNDRED FEET LONG BUILT IN FOUR DAYS.—The Linden bridge over the Susquehanna river near Williamsport, Pa., was recently burned on a Thursday evening; workmen and materials were assembled next day, and on the following Tuesday the cars were running over the new bridge, 1,135 feet in length. The original bridge was of the Howe truss pattern, roofed and lined inside and out. Cost, $110,000.