Carpenters and cabinet-makers will affirm that wood of all kinds shrinks very much more under the circumstances mentioned, than where the air supplied to rooms attains a proper hygrometric condition before it enters them. And the most superficial observer can scarcely fail to be convinced of the truth of this statement if situated to observe and contrast the effects of moist and dry air upon wooden articles. We have seen these effects upon the panels of doors, almost ready to drop out, and upon furniture the glued joints of which were torn asunder by undue and unequal shrinkage caused by the breath of the fiery simooms from the registers, which too often convert parlors into ovens which kiln-dry not only every inanimate object containing any moisture, but also the dwellers in these health-blighting inclosures.

It costs some trouble to prevent these evil results by keeping an ample supply of water in the furnaces, but it will cost more trouble not to do it.

Any one who has attempted to cultivate house-plants in a room warmed by heated air has noticed how quickly they droop and languish when the water is out of the heater, and there are not a few people who are so sensitive to the effects of what is generally termed "dry heat," that they can determine almost immediately, by their uncomfortable sensations, when the water supply has failed.

We trust the article referred to will not have the effect to render any one who uses a hot-air furnace neglectful to keep the water reservoir constantly supplied. This subject has received the most careful attention from scientific men, and it has been long generally admitted that without proper attention to this important particular, hot-air furnaces are capable of doing great mischief.

WANTED---BETTER SIDEWALKS.

The question of improved sidewalks is collateral to that of improved pavements. There are serious defects in the sidewalks now generally used. We sum up the case against them as follows; premising that our charge is against bricks and flags, which constitute for the most part the materials of our present side walks.

First. They will not stay where they are put. They become rough and uneven, and both tender toes and high heels are made to suffer by collision against the insignificant precipices which threaten the soles of all foot passengers.

Second. They are liable to get slippery and dangerous upon the slightest provocation of rain and frost. They are then simply inclined planes of ice, down which people slide incontinently, in peril of life and limb. A learned surgeon once remarked in our presence that injuries to the hip joint received by falls upon slippery pavements, were a fruitful cause of that painful and dangerous affection known as "hip disease," and it is quite probable that more wrists are broken in this way than in any other.

Third. Bricks, when employed for pavements are, unless of the best quality, apt to crumble under the action of frost and water, and become a first class nuisance. And even when they do not crumble, they absorb water and remain damp longer than is agreeable. Water getting beneath them and freezing upheaves them even worse than flags.

The ideal of a sidewalk is one that presents a continuous even surface not smooth and glassy, and not liable to get slippery except from a considerable accumulation of ice; impermeable to water, and somewhat elastic to the tread.

The only walks we have seen at all answering to these conditions are concrete walks similar to those in the Central Park of this city, and Prospect Park in Brooklyn. And we see no reason why these beautiful paths should not replace flags and bricks in all the streets of our American cities used for residences. For business streets the heavy flags now employed are perhaps, preferable, on account of the battering they can withstand, and which they receive from the unloading of heavy packages, etc., but for our quiet up-town streets, nothing could be, in our opinion, superior to the concrete.

A PECULIAR FEATURE OF AGRICULTURAL INVENTION.

The progress of improvement in agricultural machinery has been very gradual. People not very old can recollect when the ground was plowed with the cumbrous and imperfect wooden plow; when seed was sown entirely by hand, and harrowed under by the old V-drag; when crops were reaped by the hand sickle, raked by the hand rake, thrashed with flails, and winnowed with a willow fan.

Now all this is changed. Machinery has taken the place of hand labor in all departments of farm work; but in the gradual adoption of such machinery a striking peculiarity may be observed. It might resonably be thought, that one of the first things to engage the attention of inventors, in their attempts to devise machinery for farm work, would be the first operation in the cultivation of land---plowing; and that the natural law of progress would be from this fundamental operation to the final operations of thrashing and winnowing. But the history of agricultural invention shows that precisely the reverse has been the case. Such progress as has been made, has been from winnowing to plowing.

The first inventions in farm machinery we can find were machines for winnowing wheat and clover seed. Two patents were taken out in 1776 for machines of this kind. The details of these machines have so far as we know, passed into oblivion; but a long line of honorable successors has gradually brought us the improved fanning mills of the present day; and the march of improvement has at last wedded the fanning mill to the thrasher, and even a polygamous union of raker, thrasher, and fanning mill is now extensively adopted. Nay, even the harvester, one of the latest of agricultural inventions, is now joined to thrasher, raker, and winnower, so that the grain is delivered from the field in a single operation cleaned and bagged for market.

The next steps were the invention of the modern scythe, the cradle, and the horse rake. All these have undergone great improvements since their primitive forms were introduced. Only one of these, however, the horse rake, retains its supremacy, and there are strong indications that this will ere long be wedded to some sort of apparatus for loading, sufficiently practical to secure general adoption.

The next in the regular succession of machines for the farm (properly so called) after the fanning mill was the thrashing machine. This has passed through a long probation of trial and improvement, gaining in efficiency, and being combined with other devices, until little is left to be desired.

Following the thrasher came the machine cultivators, still in process of development, for the dressing and weeding of growing crops. Then inventors turned their attention to seeders and planters, and lastly, to machine plows, of which the coming steam plow is to be the crowning act of agricultural invention.

In looking over this field and tracing the progress of invention in it, we are forced to recognize that most prominent tendency of the age, the removal of the great burden of manual toil from the human race. The majority of producers must ever be found in the noble and manly occupation of agriculture, and yet the time must come when this shall not only be the most elevated of all the departments of labor, but it will also become the least exacting. There is plenty of room for improvement yet in machines already invented, but the most immediate and pressing want is a good, yet not too costly steam plow.

THE STEAM ENGINE TRIALS AT THE AMERICAN INSTITUTE EXHIBITION.

The Superintendent's report of the steam engine trials at the American Institute Exhibition has at last been made public in what is termed the "final report" of the judges. The facts have been kept back so long that it may be necessary for us to remind our readers that the experiments were conducted for the judges by Mr. Charles E. Emery, an experienced engineer, then acting as General Superintendent of the Exhibition, and who was formerly connected with the Government experiments at the Novelty Iron Works, and who wrote for our columns a series of articles on testing steam engines. Mr. Emery states that his report contains not only the facts in the case but certain "explanations and calculations embodied by direction of the judges." To his report, therefore, we must look for an explanation of the stultifying and ridiculous decision regarding the engines, to which we have already given place in our columns.

We have examined the report carefully, and see no reason why we should modify the opinions we have heretofore expressed on this subject. As regards the two larger engines, either one or the other was the better, and the judges should have been decided enough to say which; then, if they wanted to make an explanation that the result was due to improper workmanship or attention, they could have done so consistently.

The experiments appear to have been in most respects carefully and fairly conducted. The exhibitors had an opportunity to take their own records, and while this made it impossible to tamper with the facts, it still left as much opportunity as in any case for dispute in regard to the way the facts should be presented and weighed by the judges.

The amount of coal consumed has not been considered in making the award, and had the water evaporation been accurately determined, it would not have been important to consider it otherwise than as a confirmation of the water measurement. The estimation of the coal consumption would have been liable to some error arising from differences in the state of the fire at the beginning and close of each experiment, while the water evaporation might have been obtained beyond dispute. It was necessary to estimate the quantity of coal on forty-five feet of grate at both the beginning and close of an eight hours' trial, but as this was done with great care by all the parties interested, and the coal was leveled off to a line of bricks previously agreed upon, the error could not have been large, and such a basis of computation was not much improved upon by the use of a meter to measure the feed water used. This meter did not, when tested, give the same measurement at different speeds, but from the fact that both engines used very nearly the same quantity of water in the same time it is claimed that at the equal rates of speed actually employed during the experiments, the measurements were practically accurate. This may possibly be true, but it is not known to be true. In the papers previously published by Mr. Emery on this subject he recommended the use of tanks for measuring the feed water. He explains that tanks were not used in this case for the reason that the necessary valves might be tampered with. Better erect a separate building for the tanks, and guard it by a cordon of policemen, than have any such question arise.

The boiler used it appears could not be depended upon to furnish dry steam uniformly. It may have been the best that was available at the time, but its use detracts much from the value of the experiments.

The want of time appears to have been the great drawback in conducting these trials. If similar tests be again attempted, they should be commenced earlier, and published as soon as completed, and before the public had lost all interest in them.

We extract from Mr. Emery's report such portions as will be of greatest value to our readers, and publish them in another column. Our readers will see that the calculations are reliable only on the assumption that the water was correctly measured, an assumption which we regard as so doubtful that, in our opinion, the coal consumption is by far the better basis for calculation. This coal consumption, as ascertained by the weighing during the trial, is given in the report as unreliable, and it is estimated from the water evaporation, on the *assumed* basis of 9 lbs. of water evaporated to each pound of coal burnt.

ANCIENT MODES OF EXTINGUISHING FIRES.

Fire, which was anciently considered the most mysterious and terrible of the four "elements," and for that reason was the invariable accompaniment of the process of sorcery, divination, and magic, modern chemistry has shown to be no element at all, but simply the visible effect of rapid combustion; thus, indeed, it has lost its suppositious mystery, although its real capacity of producing terror must ever remain. There is hardly a scene which the mind can present to itself more heart-rending than that of a great conflagration—a city in flames and its inhabitants driven houseless and homeless into the bleak and icy air of winter; and this, too, by the very agent which they had used to further their comfort. Like all things, enough of which is good, but of which too much is disastrous, fire is a "good servant but a bad master."

We moderns, who have the telegraph to let us know in a moment in what part of a city there is a fire, and steam fire engines to appear at the scene of conflagration with a celerity which, a few years ago, was unknown even to us, can hardly conceive the terror which the outburst of a fire in a great city of antiquity caused in the minds of its inhabitants; especially frightful must such calamity have been in time of war, when, to be driven from a beleagured city was to be driven into the midst of cruel and implacable enemies, and it is well known that fire was one of the most common and destructive means employed in ancient warfare.

Antiquity, being thus put at its wit's end, devised means of extinguishing fires which must seem to us extremely ludicrous. The first hose used was probably the gut of an ox, having at one extremity a bag filled with water, which, upon being compressed, would eject the fluid in a stream; but such a contrivance would be of but little value when a city was on fire. At best it could send a stream but a short distance and the bag would need to be detached from the hose and replenished very frequently. The houses were not seldom quite lofty, and, altogether, this primitive hose must have been very unserviceable.

Buckets and syringes were used, as were also pumps, and doubtless other machinery of which history makes but little mention. At Rome there were professional firemen trained to their duties from youth, and known as *matricularii*. They appear to have been a boisterous set of men, not altogether unlike those who, a few years ago, were led to fights and fires in New York by the celebrated "Mose." The Emperor Trajan, writing to Pliny the Younger, who was Governor of Bithynia, and had asked instructions from headquarters in regard to raising a company of professional "fire laddies," said that they were not the most peaceable citizens possible, and that "they would not fail to form themselves into factious assemblies" on the slightest provocation. Just think for a moment what must have been the result of the meeting of the rival companies of *matricularii*! We all know what good service was done by "Mose" upon the devoted head of "Syksey" when the speaking trumpet was the weapon of offense—but how ridiculous as well as bloody must have been the fights of firemen in the narrow streets of Rome, when buckets, syringes, long poles with sponges attached to them, and stones, were the munitions of war. A party running down to the "yellow Tiber" to get water for the syringes, meet another party just returning with buckets, which they have filled with the precious fluid, intending it to be used by the mop-carriers. Instantly there occurs a row, upon the issue of which depends the possession of the buckets; the moppers and the bucketers run from all quarters to mingle in the affray, and, by the time that forty or fifty ringleaders have bitten the dust, the water is all spilled and the *casus belli* removed with a vengeance. In the meantime the conflagration is spreading, and it is lucky for Rome if, before long, a whole quarter be not burned down. That this is not merely a fancy sketch, may be seen from the accounts which have come down to us, showing that the rabble of Rome was the most quarrelsome and seditious of any in the ancient world with, perhaps, the single exception of the rabble of Alexandria. Also may it be seen from the fact that the firemen were pointed out as being especially fiery and riotous.

The houses of Rome were very high, and almost always their upper stories were made of wood; this, added to the fact that the streets were generally narrow, will show how easy it must have been for conflagrations to spread. The city suffered terribly from fire many times, and several times was almost entirely consumed. Every precaution was taken, such as compelling persons to build their houses a certain distance from each other, instituting bodies of public and private watchmen, and the like, and these means, when faithfully and diligently used, were no mean preventives; but what was really needed was engines more nearly approaching to perfection, both in construction and handiness; and we find that the law at one time required every citizen to keep a private engine or *sipho* in his house.

With such inefficient apparatus was Rome guarded from fire.

In the dark ages conflagrations were common and disastrous throughout Europe, and the use of even the old engines seems to have been forgotten, certainly they were hardly used;