

INTERESTING CORRESPONDENCE.

WORKING STEAM EXPANSIVELY.

We have never been so much embarrassed with an overflow of valuable correspondence as we have in relation to this subject; and while we were hesitating what to do with it all, we were fortunately relieved from doubt by the receipt of the following communication from the engineer of the hydraulic works of the Illinois and Michigan Canal. As the theoretical question has been pretty fully discussed, and as this communication gives an account of a thorough experiment on a large scale with very marked results, we think that our readers will deem it valuable, and that our ablest correspondents will be willing to give place to it:—

MESSEES. EDITORS:—I promised to send you the results of some experiments I have been making the past summer to test the value of using steam expansively, and now fulfill my promise.

In the first place, let me say that these experiments have been made at the hydraulic works of the Illinois and Michigan Canal at Chicago. They were erected for supplying any deficiency of water in the driest part of the season that might be needed by the canal, and are capable of raising fifty thousand cubic feet in a minute: the water is taken from an arm of the lake (Michigan), which is always at or very near a uniform height, except when varied by high winds. It is raised about eight feet by means of two wheels nearly forty feet in diameter, ten feet wide in the clear, and dipping usually between five and six feet, the depth being registered day by day. Upon the outer rims of each wheel are placed cogged segments for driving it by pinions direct on the main shaft.

The ordinary duty of each wheel is from fifteen to seventeen thousand cubic feet of water per minute, which falls directly into the canal from the wheel, the height varying only about six inches as it falls, and is again filled up. The fuel is bituminous Illinois coal taken from the same bed, with not the least discoverable difference in its quality, and always carefully weighed before the firing. There are twelve boilers in nests of six in each, exactly alike, and not one leak in any of them; they are 26 feet long, 42 inches in diameter, with two 16-inch flues in each. They are fired by firemen, employed for the last twelve years, who, we have good reason to know, are capable for their places. The engines work horizontally, are high-pressure non-condensing, the escape steam heating the water for the boilers to very near 210°, which is fed to them as near as may be in a uniform stream. The firemen have a steam gage in plain view, as also have the engineers. The engines are packed with metallic rings, held out by springs in the usual manner. We use puppet valves of the usual Mississippi form, which are in perfect order. They can be worked readily at a full stroke, or cut off at any point below a half, and can be changed to any given point during the progress of the stroke, and without stopping.

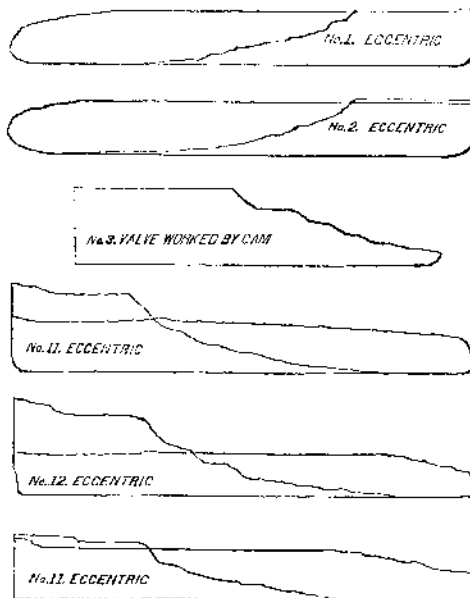
We usually carry the steam in the boilers at from 50 to 55 pounds pressure, and cut off at one-fourth of the stroke. One pair of the engines are 6 feet stroke, by 32 inches diameter of cylinder, the valves of these worked by cams. The other pair are 8 feet stroke by 28 inches, worked by eccentrics, and all cut off at the main valve by an arrangement I have never seen before, but working very effectually and certain.

With the great uniformity of the work we have to do from season to season, with so little variation of the water in the lake, and so little in the canal, any carefully made experiment here must give a reliable and truthful result; and especially when frequently repeated as it has been, I cannot see where there is a chance to doubt. The experiments have been made at frequent intervals since May, one day running with cut-off at half stroke, at others down to one-eighth, alternating with full stroke. The experiments continued daily from the 11th to the 27th of August: average about fifteen revolutions of the wheel, with the cut-off at one quarter against eleven with a full stroke; thus—Aug. 11, 10.40 revolutions; 12th, 11.00; 13th, 10.14; 14th, 11.01. Although these experiments were satisfactory enough to me, yet I deemed it proper to make some with special reference to the publication of them in your valuable paper. Accordingly on the 17th of September, every

part of the machinery was examined to see that it was in perfect working order. The boilers were cleaned out and filled with clean water. The cylinder heads were taken off at one end, and the steam allowed to drive the piston out to the end, when no leak was found traceable. The valves were all carefully examined, and found in perfect order. The covers to the cylinders were then replaced, and the works set in operation, the firemen knowing nothing of the designs we had in view; they were only instructed to keep the steam as near 52½ pounds pressure as possible, and to keep the coal evenly distributed through the day. The coal was then weighed in half a tun at a time, then allowed to burn out in each experiment until the steam fell to 50 pounds, then the next half tun would be begun upon, and the cut-off changed. This was continued for twelve experiments, and the average result was 1,254 revolutions, with the cut-off at one quarter, and 798 at the full stroke, being a little over 57 per cent gain by the use of the cut-off.

There would be many ways to judge of the reliability of these experiments, if any one were present. For instance, the moment the full stroke was put on, the firemen had to increase their efforts to keep up steam, and this was invariable through all the experiments, the full stroke having the steam low, and the cut-off having it high. In experiment No. 4, one of the firemen went to dinner, and the full stroke run down the steam 20 pounds; the cut-off took it and brought it back, but by doing so fell off say from 115 revolutions for two hundred pounds of coal down to 93, but this was counted as though nothing had occurred.

I send you five diagrams taken along through the trials that any one acquainted may see the condition of valves,



as it was working, I could send you many more, but this perhaps is more than is necessary. It has been our aim to take cards from the engines daily, and lay them away for future reference.

Thinking that even these experiments might not prove entirely satisfactory to the advocates of non-expansion, I yesterday went over with as many as I could during the day, with different firemen selected, so that they could not know what were our designs. The diagrams, 11, 12 and 11 were taken yesterday, No. 1 and 2 taken the 17th. No. 3 is from the cam engine, merely to show the state of that engine; we have not been obliged to run more than one wheel, and this has lain still.

The result of yesterday's experiments are 108 revolutions with the cut-off, and 73 with full stroke. The water in the river steady at 5 feet 3 inches; in the canal 6 feet 4 inches raised to 7 feet, which is the highest point we pump. I would remark that every part of the machinery was oiled once during each experiment; the temperature of the water for the boilers varying but little during the day. I have already drawn out these papers too long, but before closing I would be glad to say it is our purpose to use higher steam, say 100 pounds, and cut shorter, but the blow from steam higher than 50 pounds on the cut-off is unpleasant. This will, in another season, be corrected, and no doubt we shall cut at one-eighth.

A. GUTHRIE.

Chicago, Ill., Oct. 4, 1860.

A DECISIVE EXPERIMENT IN FAVOR OF EXPANSION.

MESSEES. EDITORS:—The subject of working steam expansively being the order of the day, we will give you the results of some experiments made at the Tivoli Railroad Mills, of Henry Lansing & Co., of this place. Having noticed in your valuable paper the result of the experiments at the Metropolitan Mills, we thought it to our interest to ascertain whether they were correct or not; for if they were, we had been laboring to a great disadvantage. We have an excellent opportunity for testing the matter, as our work is regular at all times. We have in use one engine of 18-inch bore, by 36-inch stroke, built by Franklin Townsend, of this place, under the superintendence of the able and efficient mechanical engineer, George P. Jackson, Esq., fitted with Burnap's patent variable cut-off valve (but no throttle valve), which consists of a cut-off valve, sliding on the back of the main valve in a steam-tight box or chamber, having no pressure of steam at all, and being varied by the governor to cut off at any point desired. The cylinder is lagged and covered to guard against condensation, and the piston is fitted with Jas. O. Haight's patent Z packing-spring, effecting a great reduction of friction; in short, it is constructed with every desirable improvement for working steam expansively. It runs 50 revolutions per minute, cutting-off at ¼ stroke, drives three runs of stones and all the other machinery connected with a first class flouring mill.

We ran one day with our usual head of steam 45 pounds, and cut-off at 9 inches, weighing the coal. The next day we carried a lower head of steam, and cut-off at 18 inches, or half-stroke, when we found that we consumed one-third less fuel the first day at short stroke than on the second on the long stroke. As we ran the same number of hours, and the labor performed was exactly the same, the stones being in the same condition both days, and the amount of flour the same, with a small amount in favor of the short cut-off, we came to the conclusion that we derived a decided benefit from the expansion. But in order to thoroughly test the matter, we tried it for several days in succession, cutting off at 9 inches one day, and 18 the next, to be certain that no difference in the atmosphere could effect the consumption of the fuel, and invariably found a gain of one-third the amount used in favor of the short cut-off system. We also found much more difficulty in keeping the low head of steam with the long cut-off. One day when we could not keep the requisite amount, we stopped until we got the steam up to 45 pounds, and then cutting off at 9 inches we had no trouble. This, we think, is another argument in favor of expansion. We also tried one other experiment, which was to carry a greater quantity of steam than was required, and throttled it in the pipes, wire-drawing it into the steam chest, and found this made a material difference, using considerable more fuel than when giving it free passage. As the result of our trials have been perfectly satisfactory to us, we have continued our former plan of working steam expansively, and have arrived at the conclusion, that there cannot fail to be a decided gain by it when the engine is so constructed as that the full pressure of steam in the boiler is conveyed directly to the piston, without throttling or strangling in the pipe or ports.

S. M. SHEPARD, Superintendent.

C. W. ROSE, Engineer.

Albany, N. Y., October 4, 1860.

NIGHT AIR.

MESSEES. EDITORS:—It has been lately discovered—as we must infer from various paragraphs just now circulating in the papers—that we are very foolish in excluding night air from our chambers. Air—air, it is contended, why should the air of the night be less salubrious than the air of the day? Why should the air which the “songster of the forest” breathes in his nest at night, be injurious to man (in his bed)? &c., &c.

Well, is it not strange that in looking at one point, the salubrity of the air, people can overlook the surrounding circumstances or conditions! We might just as well propose that a cold bath is harmless at any time or condition of the body, because water is the most salutary of all the liquids.

It seems as if those “lovers of night air” forget that, 1st. We are undressed at night (not wholly so, its true), though more or less under quilts, &c.

2d. That we lie wholly *inactive*, except breathing, perspiring, and, perhaps, kicking away the covering!

3d. That there is a difference in climates; that the night air of the eastern coast of America is not the night air of Venice, of Constantinople, of the Society Islands, or even of London!

4th. That the frequent change of the temperature in the night would, even if taking place during the day, be perceptibly felt by every one in full dress and activity.

We might enlarge on these points, but will rest here and leave it to our night air friends to upset our opinion.

In conclusion, we only beg to express our humble advice to those readers who, on one side, have no ventilated apartments, and, on the other, are not obliged to sleep in a room overcrowded with company, and we feel pretty sure in the safety of our advice:—Open your chamber windows after you are dressed in the morning, and shut them down just before you undress for the night, and then go to bed perfectly satisfied that your health is safe with regard to

AIR.

Portsmouth, N. H., September, 1860.

[After the sun has set at night, and before it rises in the morning, all air is night air. The question is whether it is best to breathe that which is out of doors or that which we have shut up in our rooms during the day. In the first place, it is to be remarked that exposure of the unprotected body to the cold is injurious, and may very well counteract a portion or even the whole of the good effects of breathing fresh air. But if the system is properly protected from the cold, we have no doubt that a slow change of the air in our rooms, at night, is beneficial. Air that comes from the lungs is deprived of a considerable portion of its oxygen, and is charged with an extra supply of carbonic acid, which is a deadly poison to everything that breathes the breath of life. Besides this poison, the air from the lungs is full of waste animal matter, which, in densely crowded apartments, collects in such quantities on the walls that it has been scraped off and subjected to a series of experiments. For our own part, when we have breathed a pint of air once, we do not want to draw it into our lungs again until it has been out into the laboratory of nature, and been purified by having its dirty animal matter washed out of it, and its poisonous carbonic acid diffused abroad through the whole ocean of the atmosphere. The world-renowned Dr. Beaumont says: "No matter how bad the air is out of doors, it is always worse in the house."—EDS.]

ENTHUSIASTICALLY COMPLIMENTARY.

The annexed letters we select for publication from a number received in two days, last week. They indicate the sentiment of nearly every inventor who has had patent business prosecuted through the Scientific American Patent Agency:—

MESSRS. EDITORS:—A conviction of duty and obligation has been burdening me for some time, in reference to an acknowledgment I deem justly due to the great "American Patent Agency," for the prompt and efficient service rendered in making out specifications, the beautiful drawings of models, and the obtaining numerous patents within two years past, without a *single failure*. I once thought I could make out my own specifications and drawings, but I am thoroughly convinced it would have been greatly to my disadvantage, had I attempted it. I have often been delighted when a specification has been sent to me for my signature, to discover the tact, skill and talent displayed in the choice of words, and of the phraseology used in describing and making perfectly clear the novel features and new points desired to be brought out. In one or two instances there were important points made clear, that I had not discovered myself in my own model.

I take pleasure, yea, pride in affirming my conviction that the great American Patent Agency, and SCIENTIFIC AMERICAN, combined, are wholesale benefactors of this entire country, and of inventors in particular. The Scripture affirmation is that the truly benevolent or christian man "seeks his neighbor's wealth." There is a justifiable pleasure and pride in doing good to others, in lightening the burdens of this life, and causing prosperity and good cheer to spring up almost unexpectedly in thousands of widely separated families. The golden sands of useful truths and of scientific facts come tumbling along

every week from the SCIENTIFIC AMERICAN into our families, to such an extent and of such a character that I often regret that every progressive family (or susceptible of being made progressive) could not be furnished with the perusal of its luminous pages. The sentiment advanced in one of the back numbers of your journal, that "the greatest discoveries have been made in leaving the beaten tracks of science and going into the by-paths," struck me as a useful fact, and is "an apple of gold in a picture of silver." I wish to say further, as facts are what we have to do with to a great extent, that moderate prices and *fair dealing* have characterized all my transactions with the Scientific American Patent Agency.

I am in the receipt, this day, of your note informing me that my patent is ordered to be issued. This is the more gratifying as I have this day made a successful trial of the horse rake; it works to a charm. From 6 to 12 pounds is all the power necessary to be applied with the foot. A boy 12 years old can work it with ease. Please accept my thanks for your numerous favors:

J. C. STODDARD.

Worcester, Mass., Sept. 5, 1860.

MESSRS. EDITORS:—Allow me to thank you for the assistance you have rendered Mr. Littlepage and myself by inserting in your columns the article in regard to the tests of water wheels. We regard it as another evidence—

1st. Of your aim to publish correct data only, and to lay doubtful information, from whatsoever source, open to correction; truth suffering nothing from investigation and discussion.

2d. That you will extend even justice to all, though unknown and from "Texas."

You can hardly be aware how cheering it is to a poor inventor, accustomed to meet with a doubtful shrug of the shoulder in the way of assistance, to find that with MUNN & Co., at least, he stands on the same footing with a "nabob," and will find such protection as even-handed justice would dictate and the public interest will allow.

Many a struggling inventor would gather strength from this knowledge, to overcome the many difficulties he encounters in mounting the first round of the ladder of success.

To this I would add my feeble testimony in stating that inventors need not fear of being led on or encouraged by your establishment to spending their money in the pursuit of inventions such as, in your opinion, would not remunerate the applicant. At least several of mine, of doubtful nature, have been returned to me with the advice to experiment with them, simplify them, and to test them as to their value and usefulness, &c.

When it is remembered that an inventor is generally slow—very slow—in discovering the defects of his own productions, such disinterested advice cannot be too highly appreciated, although it may tear down "castles built in the air," and thereby prevent *greater* disappointments and loss of money. ROBERT CREUZBAUR.

Austin City, Texas, Sept. 5, 1860.

MESSRS. MUNN & Co.—I am happy to inform you that my Letters Patent have just been received from Washington, for my improved buggy plow; and you will please accept my sincere thanks for the very prompt and efficient manner in which you conducted my case at the Patent Office. I would further say, that you have secured all my business at the Patent Office for the future, and that of all my friends, as long as you conduct business as satisfactorily as in the present case.

EDWIN J. FRASER.

Kansas City, Mo., Oct. 4, 1860.

MESSRS. MUNN & Co.—We have received our Letters Patent from Washington. Just one month from the time we acknowledged our papers and forwarded them to you, we were in receipt of our patent deeds. This, as well as other business we have had with you, was promptly attended to, and increases our confidence in your agency, so that we shall endeavor to increase your list of clients, and engage your able counsel in all cases of the same kind we may have hereafter. For your energy and prompt attention to our case, you will please accept our most sincere thanks.

G. W. & J. J. KERSEY.

Beartown, Pa., Oct. 5, 1860.

A COLUMN OF VARIETIES.

The special correspondent of the London *Times* gives an amusing account of the attempts of the Chinese to work the engines of the *Cormorant*, the British vessel sunk last year in the Pei-ho. The Chinese, it seems, succeeded in raising the sunken vessel. They then built a boat, into which they transferred the *Cormorant's* engines. But alas! they would not work, and no one could set them going. So Sang-holin-sin sent down four watchmakers from Peking. "You are accustomed to machines," said he; "set that barbarian machine to work or I will cut off your heads." The unhappy watchmakers succeeded in lighting the fires and inducing the smoke to ascend through the funnel. This seems to have contented their taskmaster, for, though the engines are not working, we have no account of the watchmakers decapitation.

In 1842 an Irish boy by the name of John Kelley, living at Chatham Four Corners, in this State, received a gun shot wound in the shoulder, and the surgeon who dressed the wound, though he felt the ball with his probe did not deem it prudent to remove it. On the 15th of June last, the boy, (of course become a middle aged man), died in Clinton county, and on the post mortem examination the ball was found embedded in his heart where it had been carried 18 years.

Professor Newton of Yale College, has a long article in *Silliman's Journal*, on the great meteor which flashed over this city on the 15th of last November. From a comparison of all the testimony, he comes to the conclusion that its velocity must have been greater than 21 miles in a second, from which it would follow that the body could not have been a little moon revolving around our earth, nor even a planet revolving around the sun, but that it must have come from the depths of space beyond the boundaries of the solar system.

A series of investigations extending through the last 20 years, and conducted in the most careful manner, by the ablest physiologists of France, Germany, England and America, have demonstrated that the liver of man, as well as that of most other animals, secretes sugar from substances brought to it by the blood, and it is found that the liver continues to produce sugar some 24 hours after death; even when the organ is removed from the system.

It is found that for persons to acquire the wonderful dexterity exhibited by our telegraph operators, it is necessary that they should begin to learn the art while they are young. Dispatches are transmitted about as fast as a man can write, and the operator reads them by listening to the clicking of the instrument, writing the words down as they are received. Reading by the ear is found to engender fewer mistakes than the old recording process.

On the 17th of July, a great meteor fell in India. It is described in a letter to the English papers as having produced a noise as if all the artillery in India had been discharged at once, and the writer says that he actually thought the mountains were falling down. He saw a piece fall, and sent some Sepoys to dig it up. They found it buried three and-a-half feet in the ground, and so intensely cold that they could not bear their hands on it.

A man in Iowa, not far from Mercer county, Missouri, being annoyed very much with persons stealing water-melons, put poison in some of them. Five men who went into the enclosure, got hold of some of these poisonous melons, ate three of them, and three of the party were found dead in the enclosure, and two just outside.

Howe's standard scales at the State Fair in Maine, weighed 3,820 persons, the women averaging 126 pounds 5 ounces, and the men 152 pounds. This shows the women of Maine to weigh 9 pounds 7 ounces, and the men 5 pounds 3 ounces more than in Massachusetts, by the specimens weighed in the Mechanics' Fair.

Sulphurous acid, though extremely volatile, will not evaporate in a platina crucible previously heated red hot. If, however, a few drops of water are thrown in the mixture is brought into intimate contact with the sides of the vessel, and such is the energy of the evaporation of the acid and its absorption of all the heat of the water, that the latter will not only be left behind but perfectly frozen in the red hot crucible, from which it may be thrown out as a button of ice.

The richest man in Great Britain is the Marquis Westminster, whose annual income is about \$7,000,0