POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported expressly for the Scientific American.]

On Thursday evening, June 21st, the usual weekly meeting of the Polytechnic Association was held at its room in the Cooper Institute, this city; Professor Mason presiding.

MISCELLANEOUS BUSINESS.

Granulated Cork.—Mr. S. W. Smith, of this city, exhibited samples of granulated cork intended as a non-conducting packing for refrigerators. The granulated cork is made of the refuse, by a recently-patented cork-cutting machine. The refuse parings and imperfect pieces of wood are put through a mill which chips them up to about the fineness of very coarse sawdust. The granulated cork is especially recommended as packing under sheet metal roofs, to keep out the sun heat. Its value has been tested for that purpose, and as a lining for refrigerators and water-coolers. The advantages claimed for it over other substances applied to similar use are that it is not subject to dry-rot or other decomposition, that it is light, easy to handle, does not absorb moisture and is cheap. Mr. Smith sells it for 50 cents per barrel.

The president remarked that this substance promised to be of utility in the lining of refrigerator cars. Heretofore, sawdust and charcoal had been used. At present, charcoal is preferred, and a few cars have been lined, at a considerable expense, with slabs of cork closely laid together, but the granulated cork seems to be preferable to either. Refrigerator cars have been found practicable, and will come into extensive use, and anything which promises an improvement for them is worthy of serious attention.

The Re-organization.—A communication was received from the Committee of Arts and Sciences, establishing the re-organization of the Club, as agreed upon last week. The new order of things will be probably put in operation at the next meeting.

Artificial Leather.—Mr. Penniman presented samples of artificial leather or leather-paper, manufactured at North Amherst, Mass. The basis of this leather is the scrapings of curriers, and waste pieces of leather. This material is treated in a paper mill precisely like rags, being reduced to a pulp and formed into sheets. The artificial leather, of course, has not the strength of genuine leather, but in other respects it appears about the same, and may be used as a substitute for leather when no great strength is required. It is especially recommended for the lining of the soles of shoes, cap fronts and dashers for carriages.

Mr. Johnson—Mr. Cooper uses a great deal of waste leather for the manufacture of glue. Glue or gelatine is the chief constituent of leather.

The President—Prussia requires that her soldiers shall return to the government their old shoes, before they can have new ones.

Mr. Butler—This is the reason that prussiate of potash is manufactured so extensively in Prussia.

The artificial leather seemed to meet the approval of the meeting.

The president here announced the regular subject—"The Cut-offs of Steam Engines."

DISCUSSION.

Mr. Stetson opened the discussion with remarks on the importance of the subject. Nearly all of the ten thousand steam engines in and about the city of New York are provided with cut-offs, and engineers and owners of engines generally approve their use. But the exact gain or loss (as some contend) by cut-offs is not clearly understood. If they are useless, we must examine the subject so as to find it out.

Mr. Bowell—Mr. Isherwood, the author of "Engineering Precedents," has examined the details of the experiments recently made at the Metropolitan Mills, and fully endorses our conclusion that there is no advantage in the use of the cut-off. Mr. Isherwood has examined the subject of cut-offs with great care, and his convictions are positive against their use.

Professor Hedrick—In the cylinder without the cut-off, the force of the steam is nearly constant to the end of the stroke; not absolutely constant, for the reason that the piston is moving away from the stroke. When the cut-off is used, the force gradually diminishes, so that if the tension is low and the cut-off short, the force exerted at the end of the stroke is nothing, or is in the contrary direction. If the resistance to be overcome or the work to be done is unvarying, the force employed should be constant. There is, however, a clear theoretical gain in the use of the cut-off, and I shall be able to present it at another meeting.

Mr. Garvey—In the discussion of this subject the difference between dry and wet steam must be kept in view. If cut-offs are of use, it can only be in the case of dry steam.

The Association then adjourned to 8 o'clock P. M., of the 28th.

WATER WHEEL EXPERIMENTS.

We publish the following from the report (just received) of Chief-engineer H. P. M. Birkenbine, to the Select Council of the city of Philadelphia:—

GENTLEMEN:—In answer to your resolution of May 31, 1860, the department would submit the following general report upon the experiments made with turbine wheels at Fairmount Works:—

The experiments were made in obedience to a resolution of the Committee on Water, and by an appropriation of $500 made by councils. An advertisement was inserted in the SCIENTIFIC AMERICAN, calling attention to these experiments. If a detailed report is thought desirable by your honorable body, an appropriation of $350 will be necessary to print it in pamphlet form, with the necessary diagrams and tables to make it fully intelligible and useful.

An experimental apparatus was constructed at Fairmount Works, for the purpose of testing such turbine water wheels as might be presented. The department entered reluctantly into these experiments. First, for the want of time to conduct the investigations with the care and detail which their importance demands; second, on account of the limited appropriation made to carry them out; third, the delay consequent upon the experiments in completing the plans and details of the works, and also the difficulty felt in making deductions from model experiments which would guide us in the selection of wheels of the great power required for these works. So far, however, as these experiments have been prosecuted, they have been carefully done. The tests were made simply for the purpose of ascertaining what proportion of the power employed would be utilized by the different wheels or their co-efficient of useful effect. The wheels were tested under a head and fall of 6 feet, and weights of from 500 to 1,600 pounds were raised from 14 to 25 feet.

Nineteen different wheels were tested, and 122 different experiments made with them. Several of the wheels were removed without submitting them to a public test; of these no accounts have been kept. The accompanying table exhibits the best results obtained from some of the wheels:—

Names.	Weight raised in pounds.	Hight raised, in feet.	Cubic feet of water discharged.	Head, in feet.	Time, in seconds.	Ratio.	Date of trial.
Monroe & Bartlett, Worcester, Mass	850	25	166.72584	6	30	.8369	Oct'r, 5, 1859.
Reuben Eich, Salmon River, N. Y.	750	25	80.15635	6.1	33	.6132	" 24, 1859.
J. Littlejohn, Austin, Texas	1600	14	109.384	6.15	25	.5415	Nov. 23, 1859.
M. Tyler, West Lebanon, N. H.	825	25	77.21536	6	25.6	.7123	Dec. 19, 1859.
N. R. Merchant, Guilford, N. Y.	1100	25	114.335	6	33	.6412	Jan. 13, 1860.
L. W. Blake, East Pepperell, Mass.	925	25	95.6150	6	29.3	.7189	" 20, 1860.
Collins, Haydock & Willdman, Troy, N. Y.	900	25	78.329	6	27.6	.7669	Feb. 9, 1860.
L. Smith, Reading, Pa.	1300	23	110.93568	6	29.3	.7589	" 21, 1860.
E. Greselin, Philadelphia, Pa.	1000	25	81.29696	6	25	.8210	" 24, 1860.
L. E. Stevenson, Paterson, N. J.	925	25	76.25498	6	25.6	.8277	March 9, 1860.
A. P. Mason, Buffalo, N. Y.	750	25	73.67488	6	23.6	.6234	" 15, 1860.
Andrews & Kallbach, Bernville, Pa.	700	25	60.0604	6	18.5	.8197	" 23, 1860.

Mathematical accuracy was not aimed at, but the experiments may be relied upon as practically correct. The apparatus was of the most simple character, and the arrangements such that no mathematical formula was required to ascertain the amount of water used or result produced; but they were actually weighed and measured.

It was necessary to refuse to test a number of the wheels, as the appropriation was all exhausted and the completion of the plans for the wheels could be no longer delayed, and the department was so fully occupied with the extension of the works that time could not be found to pay them the proper attention.

Valuable assistance was rendered in these experiments by the chairman of the Water Committee, O. H. P. Parker, Esq., James Millholland, of Reading, Wm. B. Bement and Charles S. Close, of this city. Among the wheels which produced the best results, and to the makers of which certificates have been given, as shown in the accompanying table, the highest co-efficients of useful results were produced by the Jonval wheels made by J. E. Stevenson, of Paterson, N. J., and E. Geyelin, of this city, and a modification of the Parker wheel, made and patented by Andrews & Kallbach, of Bernville, in this State. The majority of the wheels worked very satisfactory, and the makers of them were mechanics of more than ordinary ability. It is believed that no country could produce, from the same number of wheels promiscuously collected, so satisfactory a series of experiments.

The best result was procured from the Jonval wheel made by J. E. Stevenson, of Paterson, N. J., which gave an actual useful effect of the power employed of nearly 91 per cent. The wheel of Andrews & Kallbach, of Pennsylvania, is remarkable for its simplicity; and, had it been constructed with the same amount of care and finish as that of some of the others, it is believed that the co-efficient of useful effect would not have been surpassed by any. Two of these wheels placed upon a horizontal shaft might make a most desirable arrangement for our new works; but the department is not prepared to recommend their adoption, as it might involve a risk of a failure, and we are adverse to making any experiment at so great an expense and loss of time which might result to the city. We have been unable to find any wheels now in operation of the aggregate power that we will require, or arranged in the above manner, or under similar circumstances to our requirements.

The department, therefore, see no reason to change the plan of the works, and will adopt the Jonval turbine, arranged and geared similar to the one now in use at Fairmount.

In coming to the above decision, and recommending the Jonval wheel, the department has been influenced by the following considerations:—

First, They have always been esteemed among the most efficient wheels, and, although other forms of wheels have been removed to give place to Jonval turbines, the department does not know an instance where the turbine wheel has been taken out to introduce another form of wheel. Our experiments upon the turbines have also proved them the most effective, giving the highest co-efficient of useful effect.

Second, They are the best adapted to our particular situation, on account of the comparatively small fall at Fairmount and the large amount of power required for each wheel (a mean of 125-horse power), and the low velocity they run as compared with other turbines, making less reduction of the speed necessary by means of gearing.

Third, Their durability, and the facility with which repairs and renewals can be made.

Fourth, They can be constructed and connected to the pumps at as small cost as any other form of turbine wheel. No objection can be urged against the Jonval wheel, arranged as proposed, except that involving mere mechanical arrangements, viz.: the step and bevel gearing necessary. Practically, these are not objections; the step of the present wheel at Fairmount Works has required but one renewal since it has been erected, which is the only repair found necessary to the wheel; and, as regards the bevel gearing, or reducing the velocity for the proper speed of the pumps by two or four wheels, there is only an apparent additional loss by friction, but none in reality, as a little reflection will demonstate.

Fifth, The favorable experience the city has had with the wheel of this kind at Fairmount, built by Emile Geyelin, which has been in constant use since December, 1851.