POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute, on Thursday evening Jan. 5, 1865, the President, S. D. Tillman, Esq. in the chair.

The President remarked that as it was the beginning of the year he would read, in place of the usual summary of scientific news, some statistics of the annual trade and industry of the country. A statement that our exports exceeded our imports led to a brief discussion on—

THE BALANCE OF TRADE AND THE CUSTOM HOUSE BOOKS.

Mr. Adriance explained that at our custom houses the imports are entered at their cost in specie, and the exports at their cost in paper. Reducing the exports to their specie value there would be a balance of trade against us to the amount of $80,000,000.

Mr. T. Smull remarked that this was a good thing, it shows that our commerce is profitable to the country. If our imports were not of more value in our markets than the exports, our merchants would not merely be doing business for nothing, but they would also be losing the freight, insurance, port charges and all of the other enormous expenses of transporting merchandise over the ocean. The balance of trade against a nation, as shown by custom house books, is simply an expression of the cost and profits of commerce. Trade is mutually beneficial, and every nation has a balance of trade against it every year.

A SPECIMEN OF MICROSCOPIC ENGRAVING.

The President exhibited an engraving of the Declaration of Independence, of precisely the size of a silver dime. It was engraved on steel by hand for the Bank Note Company. It had the signatures of the drafting committee only, and these, being larger letters than the body, could be read by the aid of a good eye-glass; but a microscope was required to read the remainder

The President next called on Mr. Watson to open the regular subject of the evening—

THE MANUFACTURE OF THREAD.

Mr. Watson:—Mr. President—To the people of this country at large, the importance of a good sewing thread is very great. Until a few years, almost from the commencement of the war, English thread controlled the market, but within the time spoken of a vast trade has sprung up, involving tens of thousands of dollars of capital and giving support to hundreds of persons. There are, at this time, in this country, many thread mannfacturers, and the aggregate value of the manufactured product amounts to $4,000,000 annually. The number of yards made is incalculable.

The necessary qualities in a good sewing thread, are strength, smoothness of finish, regularity in size, rotundity, freedom from knots, and uniformity in the quality. All these are obtained in our best American threads. I have been at some pains to obtain the leading threads in the market, and I have brought here, for your inspection, the Willimantic thread; the Green & Daniels thread and the Stafford Bros. thread. In addition to these there are other threads made. Perry's Water-twist, Samoset, Shaker's, and Circassian, are well known brands.

I have here also an English thread of Coats, and another one whose name I shall not give; the latter I submit for your examination. [The speaker here handed around an English thread which was very inferior.] Coats English thread is justly celebrated, it has been in the market twenty-five years and is uniform in quality; I think, however, that our domestic thread is, in all respects, superior. In the matter of strength I will make a simple test. I have here a spool of Coats's six-cord cotton and one of the Willimantic Linen Company. They are both of the same number—twelve—and both are taken indiscriminately from a dealer's stock in a store. I have but little faith in public experiments, for like spoiled children, they seldom show to advantage, nevertheless I will tie both together at the same length and see which will break first. [The speaker here tried the experiment, which resulted in the breaking of the English thread.] This accords with private experiments to determine the same thing. I took weights and applied them to a suspended Coats thread. When it broke I took the same weights and applied them to an American thread, which not only sustained them, but twenty-five per cent additional weight, without breaking.

I have heard it asserted that a glazed thread will lose its strength after the size has been washed off. I tried an experiment to determine this also, and saw no difference whatever, although I think it is possible to wash any glazed or unfinished thread for sinister purposes, so that the fibers will be dissolved or torn apart, and the strength destroyed.

I have here an American thread made by Messrs. Green & Daniels, and one made by Stafford Brothers; that of Messrs. Green & Daniels is styled "ivory finish," that of Stafford Brothers "enameled thread." Both of these threads are first class goods. They are 200 yards spools, four-cord threads and warranted to be as represented. They are now widely used, and manufacturers have told me that they used American black glazed thread in making silk cloaks, it being cheaper and as durable for their purposes as silk thread itself. I am also informed that three-fourths of the thread now in use is American thread, and our manufacturers are putting up extensive works to enable them to supply the demand.

The Willimantic Linen Company have erected a mill in Connecticut over 400 feet long at a cost of $1,000,000, in which they will make a six-cord soft-finish cotton. Very little soft-finish cotton has heretofore been made in this country, for the reason that our makers have had from 75,000 to 80,000 dozen glazed thread ordered in advance of their ability to supply it, so they were unable to make other kinds.

There are many persons who dislike glazed thread, and the introduction of it was attended with difficulties. It was asserted that the cloth was cut by it, that it ran stiffly through the needle and was liable to kink. These defects are apparent where thread is glazed too much, and experience has shown our makers that a little or medium sizing is preferable to a greater amount.

For sewing machine use glazed thread is much liked. I have questioned many sewing-machine operators, and they assure me that what I have stated to this meeting previously, is correct. In my own family I have been in the habit of using the Willimantic Linen Company's thread, and I may here say that I was led to examine the subject from the excellence of that article. I therefore do not speak from casual acquaintance but from actual test.

Our American cottons, at least that variety last named, are four-cord. From No. 40, up, the Willimantic cotton, and I presume the others also, is made from Sea Island cotton, which is the finest in the world for that particular service. The lower numbers are long staple, Gulf, or Texas cotton. Some cotton from Pernambuco, South America, has been tried by the Willimantic Company, but they were unable to use it, and suffered loss from the experiment.

The sizing of thread is commonly supposed to be starch. It is not. What it really is, the manufacturers know best. That is one secret which I cannot disclose. I am able to inform you, however, that one firm used an article called salep procured from Turkey. I have never seen any salep, but am told that it is exceedingly hard and almost vitreous in its nature, and one of the most difficult substances to grind known to man. It will destroy a French burr mill stone, and is, if my informant did not tax his imagination too highly, a most remarkable article. In the place of this salep, five ingredients are used but of the nature and proportions of them I am ignorant. A sized thread is more costly and troublesome to make than soft finish.

English manufacturers are now putting up a mill in New Jersey, which they intend to stock with English operatives, for the purpose of competing with American makers.

From what I have said it will be seen that American thread is, in all respects, equal to the imported. I am unable to see why it is not better; for my own use I prefer it to English. It is certainly cheaper, for the best American threads can be bought for $1·10 to $1·15 per dozen, where the foreign-made costs $1·50. If it be urged that the duty on the latter is great, I present for your consideration the war tax of our makers, which is, I am sure, quite as onerous.

If it be a fact that American thread enjoys a monopoly of 75 per cent of the trade, I hope the time is not far distant when it will absorb the remaining 25 per cent, and retain the home trade for home makers.

PROF. RANKINE ON THE DENSITY OF STEAM.

After the completion of Messrs. Fairbairn and Tate's experiments on the density of steam, a full account of which has been given in the SCIENTIFIC AMERICAN, a paper was read before the Royal Society of Edinburgh, by W. J. Macquorn Rankine, C. E., LL.D., F. R. SS., the object of which was to draw a comparison between the results of the mechanical theory of heat and the results of the experiments. For a copy of this paper we are indebted to the author. He deduces the general equation of thermo dynamics from the "hypothesis of molecular vortices," otherwise called "the centrifugal theory of elasticity," and shows that this equation gives results coinciding almost precisely with those of Fairbairn and Tate's experiments. The following extracts from the paper may interest a portion of our readers.

ABSOLUTE COLD AND ZERO OF GASEOUS TENSION.

"These symbols have the following meanings:—T, the absolute temperature of an elastic substance as measured from the *zero of gaseous tension*, a point which was then estimated to be at 274°·6 Cent. below that of melting ice, but which is now considered to be more nearly at 274° Cent., or 493°·2 Fah., below that temperature. K, a constant, expressing the hight on the thermometric scale of the temperature of total privation of heat above the zero of gaseous tension. This constant was then only known to be very small; according to later experiments it is either null or insensible. C, the absolute temperature of melting ice, measured from zero of gaseous tension (that is to say, according to the best existing data, C=274° Cent., or 493°·2 Fah.)"

DENSITY OF STEAM AT VARIOUS TEMPERATURES.

"The experiments of Messrs. Fairbairn and Tate on the density of steam are described in a paper which was read to the Royal Society of London, as the Bakerian lecture, on the 10th of May, 1860, and published in the 'Philosophical Transactions' for that year. The results of those experiments give what is called the 'relative volume' of steam; that is, the ratio which its volume bears to that of an equal weight of water at the temperature of greatest density, 39°·1 Fah.; but in the following table of comparison, each of those relative volumes is divided by 62·425, the weight of a cubic foot of water at 39°·1 in lbs., so as to give the volume of one lb. of steam in cubic feet. The numbers of the experiments are the same as in the original paper; those made at temperatures below 212° being numbered from 1 to 9, and those made at temperatures above 212° from 1′ to 14′.

No. of Experiment.	Temperature Fahrenheit.	Volume of 1 lb. of Steam in Cubic Feet. By Theory.	By Exper
1.	136·77	132·20	132·60
2.	155·33	85·10	85·44
3.	159·36	77·64	78·86
4.	170·92	60·16	59·62
5.	171·48	59.43	59·51
6.	174·92	55·18	55·07
7.	182·30	47·28	48·87
8.	188·30	41·81	42·03
9.	198·78	33·94	34.43
1′.	242·90	15·61	15·11
2′.	244·82	14·77	14·55
3′.	245·22	14·67	14·30
4′.	255·50	12·39	12·17
5′.	263·14	10·96	10·40
6′.	267·21	10·29	10·18
7′.	269·20	9·977	9·703
8′.	274·76	9·158	9·361
9′.	273·30	9.367	8·702
10′.	279·42	8·539	8·249
11′.	282·58	8·145	7·964
12′.	287·25	7·603	7·340
13′.	292·53	7·041	6·938
14′.	288·25	7·494	7·201

AT Carbondale, Ill., there are three cotton gins in operation, and all have been busy since the beginning of the season. Three hundred bales have been pressed there, and sent to market, all from the vicinity. Other gins are at work in the county.