

## AWARD OF PREMIUMS AT THE AMERICAN INSTITUTE FAIR.

From the long list of premiums bestowed at the late Fair of the American Institute, we select the principal—those for which gold medals were given:—

Winslow, Griswold & Holley, Troy, N. Y. Bessemer cast steel.

Taghonic Iron Works, Housatonic, Mass. For the best Copake and Leste pig iron.

Capt. R. G. McDougall, No. 466 Cherry street. A model of an iron-clad ship of war for ocean service.

Woodward Steam Pump Manufacturing Co., No. 95 Bleecker street. The best steam pump.

George Dwight & Co., Springfield, Mass. Best double-acting steam pump.

Wm. D. Andrews & Bro., No. 414 Water street. The best centrifugal pump for draining, mining and bilge pumps.

Wm. D. Andrews & Bro., No. 414 Water street. Best oscillating engine.

New York Steam Engine Works, Twenty-third street, East River. Best portable engine and boiler.

Washington Iron Works, Newburgh, N. Y. An engine and saw-mill combined.

Clark's Steam and Fire-regulator Co. A patent steam and fire regulator.

Talcott & Underhill, No. 170 Broadway. The best submerged water-wheel.

F. Gutekunst, Philadelphia, Pa. The best plain photograph.

Charles H. Williamson, Brooklyn, N. Y. The best imperial photograph.

M. R. Clapp, No. 455 Water street. The best steam fire engine.

Chambers, Brother & Co., Philadelphia. A clay-tempering brick-making machine.

M. J. Campbell, A. Campbell, Agent, No. 56 Gold street. Campbell's country printing press.

Webster & Co., No. 17 Dey street. An improvement in screw wrenches, embracing pipe and bolt cutters, pipe tongs, etc.

Hiram Tucker & Co., No. 59 John street and Nos. 117 and 119 Court street, Brooklyn. Bronzed iron chandeliers, lamps, brackets, etc.

New York Rock Drill Co., No. 152 Broadway. The best steam-power rock-drilling machine.

Boston Milling and Manufacturing Co., Boston. The best quartz crusher.

Fisher & Bird, No. 97 East Houston street. Marble mantels.

J. A. Fay & Co., Cincinnati, Ohio. The best scroll saw.

Convex Weaving Co., No. 97 Reade street. A loom for weaving irregular shapes.

English Spinning Roller Co., Biddeford, Me. A main cylinder and offer grinder.

E. C. Cleveland, Worcester, Mass. A cloth-drying and tentering machine.

Hewes & Phillips, Newark, N. J. The best iron lathe slotting machines, gear cutter and shaping machines.

Richard Dudgeon, No. 24 Columbia street. The best double-acting steam hammer, hydraulic punches, lifting and pulley jacks.

H. Burden & Sons, Troy, N. Y. The best machine for making horseshoes.

Wm. J. Creamer & Son, No. 15 Platt street. Railroad safety brake.

Phelan & Collender, New York. Billiard table, combining elegance of design and durability of workmanship, with Phelan's combination cushions.

Ball, Black & Co., Broadway. A gold and silver service of plate.

Tiffany & Co., Nos. 550 and 552 Broadway. A silver service of plate.

Wm. Gee, corner Franklin and Elm. Patent soda-water apparatus.]

American Bell Co., No. 32 Liberty street. Steel and bronzed metal bells, with Harrison's patent rotating hanging apparatus.

G. W. Hough, Dudley Observatory, Albany, N. Y. An automatic registering and printing barometer.

George Steck & Co., Nos. 113 and 115 Walker street. A grand piano-forte, for general superiority.

Driggs Patent Piano Co., No. 252 Ninth avenue. A square piano-forte, for general superiority.

Lindeman & Sons, No. 2 Le Roy place. Cycloid piano-forte, for novelty of construction and general excellence.

American Velvet Co., Nos. 26 and 28 Barclay street. Silk velvet and plush.

American Water-proof Cloth Co., No. 43 Barclay street. Cap robes, table covers, car and carriage seatings and carpeting.

Florence Sewing-machine Co., No. 505 Broadway. The best family sewing machine.

Carhart & Needham, Nos. 97 to 101 East Twenty-Third street. The best organ.

J. M. Pelton, No. 841 Broadway. The best cabinet organ; made by Peloubet & Son, Bloomfield, N. J.

Bishop Gutta-percha Co., No. 201 Broadway. For gutta-percha goods, telegraph cable, etc.

Wheeler & Wilson Manufacturing Co., No. 625 Broadway. The best button-hole machine.

Lamb Knitting-machine Co., Rochester, N. Y. A family knitting machine.

O. R. Ingersoll, Nos. 243 and 244 South street. A metallic life-boat.

A. A. Marks, No. 575 Broadway. Artificial limbs, for simplicity of construction and durability.

N. W. Ringsley, No. 28 East Twentieth street. An artificial palate.

Adriance, Platt & Co. The best mowing machine—"Buckeye."

John Gowans, No. 179 Water street. The best chronometer.

## EXPERIMENTS ON THE EXPANSION OF STEAM.

BY CHAS. EMERY, ASSISTANT ENGINEER U. S. N.

[For the Scientific American.]

Few persons can agree in regard to the economy of working steam expansively, and even the opinions of well-known practical and scientific men are received with very great reluctance. Many persons have experimented, to satisfy themselves on the subject, but have arrived at various, and, often, at entirely different, results, as the back numbers of the SCIENTIFIC AMERICAN plainly show. The disparity must, evidently, be attributed to the various means employed, and to the different circumstances and conditions under which the trials were made. As was stated, in substance, in a late editorial of your journal, experiments on the expansion of steam must all be made upon the same basis and under like conditions, if it be desired to compare the results. The writer has had the privilege of assisting in the trial of many experiments on the subject, and desires, without advocating either side, to show in what manner and by what means any person may settle the question for himself, either by his own researches or understandingly examining those of others.

A practical problem may be stated as follows:—A certain amount of steam power is required to drive the wheels of a boat or locomotive, or the machinery of a manufactory, and it is desired to obtain such power at the least possible cost. We are, in this article, to confine ourselves to the relative costs of using steam at different grades of expansion, consequently all the details of the machinery used, not influencing this, must be agreed upon in the first place and remain constant throughout the experiments. In accordance with practical requirements, we will agree to make the power developed the same in each case, and compare together the several amounts of coal necessarily consumed to produce that power. We should use the same kind of coal, the same fireman and the same boiler, that no part of the loss or gain realized may be attributed to a change of either. We should use the steam at the same pressure in each instance. This is a condition not often observed, and, as it forms the chief source of error, it is the great point at issue. The pressure of steam should be the same because the cost of generating it would in each case be the same. If a person use one hundred pounds of steam, cut off at one-tenth of the stroke, in a large cylinder, what is to prevent him using the same pressure, during the full stroke, in a small cylinder; and, should this be done, to what could any loss or gain realized be attributed? Simply, we answer, to the expansion or non-expansion of the steam. But should such person use ten or twelve pounds pressure of steam, at full stroke, in the large cylinder, and compare it with one hundred pounds, cut off therein at one tenth of the stroke, would the gain in either case be due to the difference in the initial pressure or in the grade of expansion? Both would have an influence of course,

but how can we agree what modification each would cause? All works on the steam engine show a theoretical gain by the use of high-pressure steam, independent of its expansion, and this has been proved to be true in practice; we have no right therefore, to claim this gain as one due to expansion, when it is evident that high-pressure steam can also be used non-expansively. We feel assured that any person, after thoughtfully examining this subject, will allow that in all comparative experiments, on the expansion of steam, the same initial pressure should be used. The most proper way to do this is to vary the diameter of the cylinder for each grade of expansion. In a steam flouring mill, or other establishment, where the resistance is tolerably constant, this question may be thoroughly tested by making, say two cylinders, so proportioned that, to do the work, one will require the steam cut off early in the stroke, and the other late, using the same pressure of steam, same-engine frame, connections and style of valve gear. The cost of the power may be determined by running for a long time, under the usual conditions, with each arrangement, or carefully and continuously for a few days. The boiler power should be in excess, when the steam can be kept at a constant pressure by the patent steam-damper regulator. [The last suggestion will be found useful in all cases whether experimenting or not.] The coal should be accurately weighed and fired regularly, and the quantity required will furnish a practical test of the cost of the power. If greater accuracy be desired, the feed water evaporated can be measured, and the indicator and dynamometer used.

Good practical results can be obtained in a cheaper manner than the above, by varying the piston speed and using the same initial pressure in the cylinder at different degrees of expansion. To do this, and preserve the speed of the shafting and machinery, the belt or gear wheels connecting the same with the engine must be differently proportioned in each case. In many establishments, wheels are lying unused which might be applied for this purpose. Often, by uncoupling a section of the main shafting, near the engine, and driving from the engine side a countershaft, which should in its turn drive the remainder of the shafting the speed of the engine can be varied by a simple change of pulleys. The manner of accomplishing the object must, of course, vary with the circumstances. For slow piston speeds, the steam must follow farther to do the work than when the engine is running more rapidly; the initial pressure of steam and other conditions being alike. Experiments can be tried quite readily, in this manner, with any engine which has means by which the point of cut off can be regulated, though this cannot be varied greatly, unless the engine be much too large for the work it has to do. This method of procedure, by varying the size of the cylinder, is much the best, and expansion can thereby be carried to any extent, but the losses due to increasing the piston speed are small, compared with the theoretical gains of expansion, and experiments on this plan can be tried with much less outlay. The friction pressure would be practically constant, at all speeds, whence the power necessary to overcome it would vary as the velocity, and could not be easily estimated. There would be no other losses, due to higher piston speed, when the cylinder ports were of sufficient capacity to admit the steam at the increased velocities. The power required to overcome the back pressure against the piston increases with the grade of expansion in all cases.

Space will not permit further remarks on this subject. If any of the readers of your journal should try experiments, in a manner substantially as above shown, it is hoped that an accurate record of the apparatus used, and of all the circumstances attending the trial, will be made, for the benefit of others, in order that abstracts of the same may be prepared for comparison.

New York, Oct. 19, 1865.

THERE is now a very large spot, distinctly visible to the unassisted eye at sun-setting, traversing the sun's disk. As it must be of enormous magnitude we hope to hear of further observations thereon.

PROGRESS.—The first negro student at Harvard College was admitted to the Freshman class on the 21st ult.