[Special Correspondence of the Scientific American.]

THE WORCESTER MECHANICS' FAIR.

WORCESTER, Oct. 1, 1866.

When I was a boy the "schoolmarm" used to impress upon my memory the necessity of fixing permanently the natural boundaries of the States. The lakes, rivers, and States that were thus forced upon my attention have remained ever since objects of affection.

If I were asked to define the position of Worcester I should say that it was bounded on the north by engine lathes, on the east by planers, on the south by boilers, bolt cutters, and steam engines, and on the west by all sorts of machinery for various purposes. Certainly a finer show of tools than those in the Mechanics' Fair just closed here would be hard to find. I knew very well that a good many machinists' tools were constructed in Worcester, but the variety, as well as general excellence, surpassed my expectations.

The men who make the tools have associated themselves together and built one of the finest edifices in the State. It is a large and massive brick building containing two splendid halls for public amusement, beside various smaller offices and rooms occupied by other associations. In the upper hall they have one of the largest organs in the country, equal to that in Boston in point of power and tone, and, beside this, the reading room is well supplied with periodicals, so that after the labors of the day are over in the shops relaxation and information are both to be had. From these few facts you can see that Worcester mechanics are not content to plod on in the dull and well-trodden path of commonplace, but strive to elevate themselves and their profession. The result is easily seen in the quality of the work done by them. Without further preaching, I shall tell you what I saw in a few days' sojourn.

The arrangement of the material was excellent, and without that "higgledy-piggledy" appearance which characterizes too many industrial expositions. The heavy machinery was in the basement. Carriages occupied the hall of the main entrance, while above there were looms, steam engines of a small class, leather-cutting machines, and materials generally used in the arts. In the extreme upper room of the building were the finer wares, such as sewing machines, textile fabrics, clothing, etc., etc. As a consequence you knew where you were, so to speak. If you wished to examine one class of goods you could do so without running up and down a dozen pairs of stairs. Every thing could be seen systematically and thoroughly; thus, to persons who go to such exhibitions to be posted on the latest inventions and improvements, is a thing of no small importance.

IN THE BASEMENT.

The first thing that strikes the eye of the visitor on the lower floor is the large lathe for turning locomotive driving wheels. This machine is unusually fine in point of finish, while its proportions are massive. It weighs about ten tuns, and in point of convenience for shifting the carriage, general accessibility, for changing the speeds of the cone, is well constructed. The backhead and spindle are unusually strong, and taken all together it is a fine machine. It was built for a railroad company in New Jersey, and is to be sent away at the close of the Fair. Beside this, Mr. Pond turns out a number of other tools of all classes. His engine lathes are in great demand; and I was told he generally made about six every month.

THE NEW YORK STEAM-ENGINE WORKS.

Directly back of Mr. Pond is a fine boring mill designed by Mr. A. B. Couch, who knows a good tool when he sees it, and, what is more, knows how to make one. This boring mill is also at work, and has a very long bed raised by screws under each end. The frame that carries the bush which the end of the boring bar works in is unusually strong, and is not fastened to the table the work is on, but entirely independent of it, being capable of moving close to the job so as to make the bar as short and stiff as possible.

A small shaping machine was also shown by this Company which is universally admired by machinists This little machine stands on a column, the body of which holds the tools. It is not only neat looking but as solid as a rock, and has the feed so connected that the tool is advanced when about to return. It occupies but very little room and can take a good stout cut. There are also lathes and planers on exhibition by the Works which evince not only taste, but a knowledge of mechanical principles in regard to the proper distribution of the materials.

BELLOWS & WHITCOMB'S TOOLS.

In one corner Messrs. Bellows & Whitcomb have a twenty-five horse engine at work furnishing power for the machinery. There is nothing peculiar in this engine as regards the design, but it is well made and strong. The same firm also show engine lathes and portable engines which are useful and convenient machines.

KNOWLES'S STEAM PUMP.

Mr. L. A. Knowles, whose factory is at Warren, Mass., makes a fine show with his pumps. These are in all respects first-class machines, and the way they force the water is a caution. These pumps have all ground joints on the face, with steel rods and the best materials generally, and are certified by competent judges to be unsurpassed for efficiency and economy.

HENDERSON'S STEAM PUMP.

Horace McMartree & Co., of Boston, exhibit a little pump which is plainly got up, but works to a charm. The valves are rubber balls for ordinary work, and are contained in the plunger itself. It takes but little room, and runs at a high velocity without shock or jar. A very small pump, not over two and a-half inches in the barrel, threw water from an inch nozzle about 100 feet high.

A variety of other tools were exhibited here, but I have not space to enumerate all. Wood-working machines were in operation which were highly esteemed by the visitors. J. A. Fay & Co., of Cincinnati, were on hand with their scroll saw and did some fine work with it. A carving machine or tool for working out moldings on irregular forms was also shown. This was a simple machine having nothing but two cutters on the end of a spindle; by a simple arrangement the cutters were reversed so that right and left hand work could be done to accommodate the grain of the wood. A slate-pencil machine was in operation which made a great many at once. The slate was run under a row of cutters on a mandrel revolving at high speed, and came out at the other side completely finished.

WASHBURNE HALL.

In Washburne Hall there were a great many things well worthy the attention of mechanics. Not the least were some beautiful edge tools made from black-diamond steel of Park Brothers, Pittsburgh, Pa. The firm had quantities of this celebrated brand on exhibition, one piece being six inches square and about four feet long. This steel bears a very high reputation and is warranted to be uniform in quality. Just complaint on this score has been made against American steel, and we hope the reproach cannot be uttered again.

WASHBURNE'S STEAM ENGINE.

The whole of the machinery in the hall is driven by Washburne's steam engine. This is another novelty in steam motors, and is without question a most ingenious and compact machine. When I say that it is no larger than a common ice cream freezer, that it has two cylinders, 3 7-10ths inches bore by 1 85-100ths inches stroke, that it runs about 370 revolutions per minute, and drove all the machinery in the hall without once flagging or halting, your readers can form some estimate of its power. The machinery is as follows: one loom, one carding machine, one twenty-shuttle tape loom, one cloth loom, one spinner, twenty spindles, envelope machine, six fine wire blocks, three hoop-skirt covering machines, one eight-foot planer, one 16-inch engine lathe, one 15-inch engine lathe, one card and two small printing presses. These machines were all new and consequently took much more power to run than old ones, but with all that the little steam engine marched off with it easily and seemed to want more.

The simplicity of this engine commends itself to all. It is capable of being run at a very high velocity having no complicated arrangement of valves and pistons. I cannot describe its peculiarity clearly, and shall not attempt it. It is probable that your readers will have an opportunity of seeing an illustration before long.

SHAW & JUSTICE'S HAMMER.

A loud rapping attracted our attention from this engine, and on investigating the cause we found a crowd assembled round a small forge hammer. This was a new invention lately got up in Philadelphia, and manufactured by Shaw & Justice. I can describe it well enough, for there is not much to do in that way. It is simply a square block of steel suspended from a steel bow by a leather belt, much the same as if an arrow was hung from a boy's bow. This steel block moving in guides is driven at a high speed and by compressing the spring at each stroke gives a very powerful blow. The hammer was shown by Mr. Egbert P. Watson, of your city, who explained and illustrated its action. It was highly approved by all the leading manufacturers, who thought its simplicity and efficiency were very marked. I was told that many of them were now in use and that they are shortly to be introduced in some of the largest manufacturing establishments in the State. I have been thus prolix concerning this machine for it seemed to me to be a great improvement over cumbrous trip hammers that are constantly out of repair.

HOARE'S VISE.

A novel vise is shown by Mr. Hoare, which is a most convenient tool. The jaws are offset one side the screw, so that long work can be held the whole width of the jaws; a handy thing for gunsmiths, etc. The vise can also be swung round, so as to take any angle, or it can be removed wholly and put on a planer, the bottom being faced off square with the jaws.

SHOE-PEGGING MACHINE.

If there is any one among your readers who likes to peg boots for fun, I can tell him that there was a machine exhibited at this fair which knocks hand pegging into a cocked hat. By means of a small device held in the hand and turned by a crank a man can peg a row round the sole of a boot while you are looking at him. I watched this exhibitor grinding out the pegs, and I can assert that he did a good job in short order.

MUSICAL INSTRUMENT.

Mr. Isaac Fiske, of Worcester, Mass., exhibits a beautiful case of cornets, which embody many improvements calculated to enhance the tone of the instrument. By a new and peculiar process Mr. Fiske attaches the "bell" to the other parts of the instrument so that the vibration is unchecked, and that dull, muffled sound, frequently met with in others, is entirely obviated. Mr. Fiske has also simplified the manufacture of the cornet in a great degree, and has got up many tools which not only expedite the processes but enhance the strength for a given weight of material. His musical instruments are widely known and esteemed.

RULE FOR FINDING THE SIZES OF GEARS.

Mr. Charles B. Long, of Worcester, Mass., exhibits a case of boxwood rules handsomely got up for the purpose of finding the size of any gear with any desired number of teeth to the inch. He thus brings the somewhat complicated process of finding size within the comprehension of persons of limited education. The rule is marked off in vertical columns with the diametral pitch from 10 to the inch to 16. These columns also contain any number of teeth from 10 to 321, so that by referring to them any one can find the exact size of the gear in inches, the dimensions being laid down the same as a common rule; a two foot rule contains over 2,000 gears. Mechanics will find this a capital instrument.

STOVES.

The Earl Stove Company exhibited some fine wares of their make, among which was a new and efficient heater for rooms. It was designed on well-known principles so long in use in steam boilers, namely, admitting air in fine streams directly over the fire, thus consuming the products of combustion which ordinarily escape. In the hall were some fine soap-stone stoves, highly polished, which made a fine show.

I cannot begin to enumerate all the novelties shown, and may as well stop here as anywhere. The fair is one of the finest held here in a long time, and far surpasses those curious exhibitions given by that old fossilized institution in your city, the venerable American Institute. I believe the judges of this fair have no interest in the machines, and have no idea of awarding themselves premiums.

HAMMER AND PEN.

THE TARGET EXPERIMENTS AT FORTRESS MONROE.

The following account of the target firing with fifteen-inch smooth-bore and twelve-inch rifled Rodmans on the 21st ult., is from one whose position and official capacity enabled him to ascertain all the facts in relation to the trial. It will be seen that his report differs essentially in several important particulars from that published in the papers generally:—

FORTRESS MONROE, VA., Sept. 24.

On Friday, 21st inst., the firing at the great target of iron plates and massive granite backing, took place here. Frames covered with two sets of wires were arranged in front of each gun in line of fire and fifty feet apart. The wires communicated with two sets of galvanic batteries, one for each set of wires; these, in turn, being attached to two recording machines, known as the "Benton Ballistic" and "Schultz Chronoscope," and which measure the velocity of whatever projectile may be used. On firing, the shot breaks the first set of wires, and each machine records the fact. When the second set are broken the record is again made, and the interval of time taken to pass from frame to frame—fifty feet—and the rate per second, are easily obtained.

Again, when the charge is prepared, a strongly-constructed cylinder of iron, solid to all appearance, is tied to the bottom of the cartridge. It is known as the "Rodman Pressure Plug." It consists of a cylinder, nicely fitted with a piston, terminating with a cutting edge, like a tapering wedge, and rests on a thick copper disk. On the shock caused by the explosion of the charge, the copper is cut crosswise and the depth and length is proportional to the strength of powder. The precise and relative pressure of the gunpowder and velocity of projectile are of great importance in gunnery.

The target represented the section of a casemate, the like of which for strength is not to be found in the United States.

Two 4-inch iron plates were secured edge to edge and bolted to the granite, while the lower plate had six inches of sand backing between the plate and granite wall. The structure was about 26 feet high, 7 feet 9 inches thick behind the plates, with a weight on the top of 200,000 lbs. of old guns etc., to increase the inertia. The whole represented a wall 30 feet high. Many of the stone were from 1,000 to 2,000 lbs. in weight. The mass of masonry was well secured with cement, iron "dowels" and "toggles." The plates weighed each about eighteen thousand pounds.

At 11 o'clock A. M., the 15-inch gun was prepared for action. Every officer was at his post. A cartridge of 55 lbs. of mammoth powder was placed in the gun and rammed home; then followed a ponderous round shot, weighing 432 lbs. The gun was then sighted, when the warning cry was heard "flag up," "prime," "fire." In less than a second the target was struck, a flash of fire, a thin cloud of black smoke, and the air was filled with fragments of shot flying in all directions as if a shell had just burst at the target. Then came an exciting race. Fleet horses, vehicles, well loaded with living freight, and a hand car propelled by three stout negroes freighted with officers, etc., soon arrived at the point of interest. It was found that the shot had broken into many pieces; the plate and part of the shot were intensely hot; the fine dust of the fragments had probably taken fire. Its effect was an indentation in the upper plate of about 15 inches in diameter and three inches deep. At the rear of the target two granite blocks were broken and driven outward about 10 inches, and other seams were opened in their immediate vicinity. The pressure was found to be 17,000 lbs., and the initial velocity 1,155 feet per second.

A second shot was fired from the same gun, aimed at the lower plate, which was punched through, but the wall suffered less than in the first shot. It was found therefore, that the wall was saved at the expense of the plate.

The third shot was of a very different character. It was a 12-inch elongated projectile, 24 inches long, weight 620 lbs., solid, and known as the "Dyer Projectile," constructed on the expanding principle, and quite recently brought to a state of perfection by Mr. Thomas Taylor, of Washington Arsenal. The charge used, as before, was 55 lbs. The gun was that known as the "Union Gun," a 12-inch Rodman rifle. Eight of these shots were fired at the target, and four solid 15-inch shot. The scene that succeeded reminded one of the ruins of Fort Sumter. The 600-pounder 12-inch, moved with a velocity of about 1,100 feet per second; the flight was smooth and regular, and the shots were distinctly seen in flight. Their effect was tremendous. The granite was ground into dust, which filled the atmosphere; pieces of stone were seen flying toward the gun, a distance of 300 feet. Solid blocks of over 1,000 lbs. weight were sent reeling backward ten and fifteen feet—one piece of 200 lbs. weight being found thirty feet to the rear.

So ended the experiments.

ONE OF THE SMITH FAMILY.

The Atlantic Cable of 1865.

The grappling and raising of the cable of last year in 1,900 fathoms, or a little less than 2⅙ miles of water (instead of three miles, as has been so widely understood), affords, perhaps, an even more striking proof of the resources of telegraph engineering than the successful laying of this year's cable. There was, of course, no difficulty in finding the precise spot in mid ocean where the end of the broken cable lay. But it was a question whether the grapnel would drag steadily along the bottom at such a depth, or whether it would catch and jump successively from one point to another. It was not certain even that, with such a weight of grapnel wire out, it could be told when the cable was hooked, and it was a matter of the greatest doubt whether, even if once hooked, the cable could be hauled to the surface, supposing furthermore, that it was hooked within two or three miles of the broken end, so as to oppose but little friction in "coming home" along the bottom, as a cable laid with but little slack must have done to be lifted at all through two miles of water.

It is well understood that the course of the cable was first marked by buoys, and that the ship engaged in grappling—and there were four ships engaged in the task—first went according to the wind, three or four miles to the north or south, and then drifted broadside on across the course of the cable, with her grapnel dragging. To pay out 2,300 fathoms of grapnel wire took from one hour and twenty minutes to three hours, and the strain on the dynamometer in 1,900 fathoms of water was 7½ tuns, increasing to 8½ or 9 tuns, according to the motion of the ship. The cable itself weighed 14 cwt per nautical mile in water and a breaking strength of 7¾ tuns. When the steady strain on the grapnel line at the depth named exceeded 8 or 9 tuns, it was concluded that the cable was hooked, and this was generally found to be the case. Hauling in occupied five or six hours, the resistance occasionally reaching 10½ tuns. As the wire came in with the cable, the resistance due to the weight of the former lessened, and that of the cable itself increased. When at the surface, the strain on the dynamometer was from 7½ to 8 tuns, and the calculated strain on the cable was nearly up to its breaking weight. It was grappled ten times in all, and, besides being raised to considerable hights from the bottom, and then breaking or slipping off the grapnel, it was twice raised to the surface. The bottom of the ocean where the cable was raised is proved to be of ooze containing microscopic shells, and no accident can happen to the cable there unless it is purposely dragged for and broken, as it unquestionably may now be, by an evil-minded skipper having grappling gear of sufficient strength, or unless a wreck fell across it. It is now being confidently predicted by certain writers that both cables will soon be destroyed by icebergs. It is, of course, possible that they may, but the more the probabilities are examined the less they appear. Even if thus destroyed, however, in the iceberg track, which is only two hundred miles wide, the cable, being in shallow water there can easily raised and repaired.—*Engineering.*

Jungles on Fire.

The jungles of India are set on fire by the larger bamboos, as they are swayed by the wind, emitting fire from their hard glossy stems through the violence of their friction, and thus spreading destruction through adjacent mountain forests. These are so extensive that the fire continues to burn for many days together, and is as suddenly extinguished by mighty deluges of rain so common in mountainous countries where water pours from clouds resembling small catracts.

MISCELLANEOUS SUMMARY.

SOLDERING SOLUTION.—Mr. F. Oakley sends us the following recipe for a soldering fluid, which, he says he has used for many years, always with success:—

"Two ounces muriatic acid, in which as much zinc is dissolved as it will hold, to which add half an ounce sal ammoniac. Clean the metal well and the solder will run and adhere to any part of the metal to which the solution is applied. It will also solder brass and steel together."

DR. N. DYES, chief medical officer at Verdowa, has been experimenting with feeding of pigs on anthracite coal. The animals seemed to thrive so well under the treatment, that he has adopted this as an internal remedy to be used in all that class of diseases usually treated with coal tar externally.

AN official report shows that the French crops will this year fall short fully one-fourth of an average crop. In consequence, the commission and produce houses are making immense purchases of all kinds of corn and grain, and are anxiously looking for large arrivals from this country.

GOLD IN ALABAMA.—The Columbus, Ga., *Enquirer*, furnishes a communication from an "old miner," who says he has examined a mountain in Tallapoosa county, Ala., the rock of which he has tested, and which he considers the richest auriferous ore in the world.

THE telegraph in Switzerland is the property of the State. The charge is uniformly one franc for twenty-five words, or a little over one cent per word, irrespective of distance. Even at this low price a large revenue accrues to the Government.

IF a continuous solid iron rail were laid from New York City to Albany, no amount of force applied at one end could move the other in less than one minute and a quarter, the time required for mechanical force to travel in iron that distance.

AN immense aquarium is being constructed for the French Exhibition, having a front of one hundred feet. Sharks, porpoises, and every variety of fish are to be therein collected for the amusement of the public.

THE metric system is in force in France, Belgium, Holland, Switzerland, Spain, Italy, Portugal, and the States of the German Confederation, and legalized in the United States, and Great Britian.

THE value of the eyelets annually used in this country, though costing but eighteen cents per thousand, amounts to the sum of four millions of dollars.

AN expert printer will set about 25,000 letters daily, his hand traveling more than nine miles, and in the working days of a year about 3,000.

COMPRESSED peat, by a late patent, is destined to prove a rival of hard india-rubber in the manufacture of picture frames and other small articles.

IRON of a superior quality is found in abundance throughout northern Arkansas, and coal and zinc in the western part of the State.

A SEA wall for the protection of a portion of the harbor of San Francisco, is to be constructed at a cost of $2,500,000.

TWO YOUNG Americans stand first and third, out of a class of one hundred and thirteen, in the competitive examination of civil engineers, in Paris.

MORE than a million of new-laid eggs are daily imported into England from France.

EVERY thirty-five cubic feet of salt water displaced by a floating vessel are equal to one tun burthen.