A Remarkable Trial and Triumph.

The triumph of Wheeler & Wilson, at the American Institute, New York, withtheir New No. 6 Sewing Machine, was remarkable in many respects. Extraordinary and repeated examinations were made, one lasting from 10 o'clock A.M. until 6 P.M. The parts of six machines were ordered from the manufactory, and a machine was constructed of parts selected by the judges, which was then tested on all kinds of work, from gauze to heavy harness, by foot and steam power. The general quality of the Company's workmanship was ascertained by an examination of machines in their warehouses, and the testimony of many disinterested users of the machines, far and near, was procured to ascertain their practical working.

The five judges, in conclusion, unanimously reported the Wheeler & Wilson New No. 6 Sewing Machine "as a machine which, by the proof submitted, we are satisfied must eventually supersede all others now known with which it comes in competition." And they "recommend for it the highest award which it is in the power of the Institute to bestow."

The Board of Managers unanimously approved the report, and recommended for this machine the Gold Medal of the Institute.

The Board of Direction unanimously approved this recommendation, and awarded the Gold Medal to Wheeler & Wilson, the only gold medal awarded for a sewing machine by the American Institute for many years.

Business and Personal.

The Charge for Insertion under this head is $1 a Line.

Notes & Queries

W. H. C.'s idea for driving a propeller by a spring is not likely to prove practicable.—W. E. H. will find directions for making a storm glass on p. 75, vol. 30.—C. B. will find a recipe for fireproofing shingles on p. 280, vol. 28.—W. C. B. will find an explanation of the moon's variations on p. 251, vol. 31.—R. R. R. will find an elucidation of the weight on an inclined plane question in our recent issues.—M. will find directions for temperiug springs on p. 10, vol. 25.—J. H. L. can harden tallow for making candles by the process described on p. 201, vol. 24.—G. E. O. will find Warven's works on mechanical drawing and Davies & Peck's "Algebra" to be good and practical.—R. W. W. will find a description of the philosopher's or hydrogen lamp on p. 242, vol. 31.—C. H. H. will find full particulars as to Colgnet stone on p. 124, vol. 22.—J. M. will find recipes for hard soap on pp. 331, 379, vol. 31, and for bootblacking on p. 283, vol. 31.—J. J. D. will find directions for tanning skins with the fur on on p. 235, vol. 26.—W. P. P. will find a description of processes for preserving wood from decay on p. 319, vol. 31.—J. F. should refer to p. 213, vol. 31, for a recipe for polishing shirt bosoms.—J. M. H. and others can unite rubber to leather by using the cement described on p. 119, vol. 28.

(1) J. M. asks: 1. What horse power would it take to run a boat 16 feet long by 5 feet beam? A. An engine of ½ horse power would answer. 2. What is the cost of an engineer's certificate? A. See p. 282, vol. 31.

What is camphor composed of? A. It is a crystalline substance obtained from a tree. It contains carbon, hydrogen, and oxygen.

(2) G. G. L. says: I wish to make a large clock dial for my windows, and drive the hands by electricity from a regulator in the shop. Please say how I can make it? A. The electrical part consists of an electro-magnet and armature worked by a battery of two Daniell's cells. The armature is attached to a lever, having a pawl connected at its upper extremity, which moves a toothed wheel. Whenever the regulator closes the circuit, the pawl causes the wheel, which carries the hands, to advance one tooth. The regulator may be arranged to close the circuit every second or every minute, as desired.

(3) J. R. says: 1. Alexander Watt recommends to electroplaters, from personal experience, the following battery: A stoneware jar holding about four gallons receives a cylinder of thin sheet copper, dipping into water acidulated with 2 lbs. sulphuric acid and 1 oz. nitric acid. A solid zinc cylinder is put into the porous cell, which is filled with a concentrated solution of common salt, to which a few drops of hydrochloric acid have been added. What should be the diameter of the copper cylinder inside the stone jar? A. The diameter should be nearly as great as the jar. 2. Should it have a bottom to it? A. It is immaterial whether it has a bottom or not.

(4) C. A. W. asks: How are Callaud's and the Minotti batteries constructed? A. The Callaud battery consists of a glass vessel with a copper plate at the bottom, upon which are placed crystals of sulphate of copper. A zinc plate is suspended near the top and the jar filled with water. The Minotti battery consists of the same materials as the Callaud, and, in addition, a thick layer of sawdust is interposed between the copper plate at the bottom and the zinc plate at the top.

(5) W. L. L. asks: Will electricity give forth a spark sufficiently strong to light a gas jet? A. Yes, whenever it has a sufficient potential. In cold, dry weather, a person may charge himself sufficiently with electricity to light gas with his finger, by walking briskly over a carpet or rug.

(6) R. C. W. and others.—Liquids, complex or otherwise, can be analyzed with the same accuracy as solids. But it is possible so to muddle things that an experienced chemist cannot separate them again; but only by artificial means. Nature never presents such difficulties.

(7) W. C. W. asks: In what proportions shall I mix the acids and alcohols to make respectively sulphuric and nitric ethers? A. The method at present in general use for the preparation of ordinary ether—ethylic ether, sometimes improperly called sulphuric ether—is that known as the "continuous process" of Boullay. It consists in mixing together equal measures of alcohol (specific gravity 0·830), and concentrated sulphuric acid; the mixture is submitted to distillation in a capacious retort, which must be connected with an efficient condenser. Through the tubulure of the retort a tube is introduced, which is in connection with a reservoir of alcohol, designed to maintain a supply of spirit sufficient to keep the amount of liquid at a uniform level in the retort during the course of the subsequent distillation. The temperature is then rapidly raised so as to maintain the liquid in steady ebullition. The liquid which passes over consists almost wholly of ether and water, mixed with a small proportion of alcohol which has distilled over unchanged. The process may go on without interruption until a quantity of alcohol, about 30 times as great as that originally taken, has become converted into ether. Isethionic acid is gradually found in the residue. Nitric ether is obtained by gently heating one volume of nitric acid, of specific gravity 1·40 (to which a few grains of nitrate of urea have been added in order to prevent the formation of nitrous acid), and 2 volumes of alcohol, of specific gravity 0·842; the quantity of the mixture operated upon should not exceed a quarter of a pint; under these circumstances the operation proceeds quietly. The first portion of the distillate contains little except alcohol; but as soon as the liquid which distils over becomes turbid on the addition of water, the receiver must be changed and the nitric ether collected separately: the distillation must be stopped when about three fourths of the liquid has passed over, in order to prevent the ether from becoming mixed with secondary products, which cannot be removed without difficulty. The ether is purified by agitation with a weak solution of alkali, and rectified from chloride of calcium. It burns with a white luminous flame; and if heated to a little beyond its boiling point, it is decomposed with an explosion on the approach of light.

(8) J. C. B. says: A. claims that 1 lb. feathers will be heavier than 1 lb. lead, as the surface of the feathers is larger than that of the lead. Can there be circumstances that will render 1 lb. feathers heavier than 1 lb. lead? A. The weight of a body in a vacuum is increased by the weight of an equal volume of air. Hence, if the feathers displace more air than the lead, they would weigh more, in a vacuum.

(9) A. F. asks: Is there a nozzle, in use by fire departments, that can be made to throw a large or small stream at pleasure? A. Yes. It is quite a common device.

(10) P. W. asks: 1. Can a Leyden jar be charged with voltaic electricity? If so, how? A. Yes. Connect one pole of the battery with the inner coating, and the other pole with the outer coating. 2. Is a simple galvanic Bunsen cell enough to generate electricity to charge a jar? A. One cell would charge it very slightly. 3. How many Bunsen cells does it require to burn metals? A. Fifty cells would burn a small wire. 4. Would it answer the purpose, instead of coating internally, to drop strips of tinfoil in the jar as high as the internal coating should come? A. It would not, unless the strips were connected together so as to be continuous. 5. Should the bottom be coated outside? A. No. 6. Is it necessary for the jar to have a brass cap? A. No. 7. Would an iron wire passing through the cork connecting with metallic filling answer to conduct the electricity? A. Yes. 8. Is it necessary for the rod to have a brass head? A. No.

(11) J. J. J. asks: What makes water in a well look blue when sunlight is deflected on it? A. The blueness is due to a partial absorption of the red and yellow components of the solar ray, leaving the light with an excess of blue, which imparts to it its peculiar tint.

(12) P. T. M. asks: What is the easiest and best way to polish marble, agate, and granite? A. The polishing is differently carried on, according to the nature of the work. For small slabs or objects of an ornamental kind, the highest degree of finish is requisite. Polishing is commenced with pumice stone and water, and with snake stone, after which various rollers or rubbers are employed. If the object be large and flat, the rubber may be a large wooden block faced with thick woolen cloth, or a mere bundle of woolen or other cloth, compressed in a rectangular iron frame, and moved about with a handle. For smaller work, rollers of woolen cloth or list, about 3 inches in diameter are employed; some of these are charged with flour, emery, and a slight degree of moisture, which produces a kind of greasy polish uniformly over the surface. A similar cloth, charged with putty powder and water, completes the process. In some of the more delicate works, crocus is used intermediately between the emery and putty powder.

(13) W. C. B. asks: What is the difference between a high and a low pressure engine, and what effect has the difference on the draft? A. The high pressure engine has no condenser, and frequently discharges the exhaust steam into the smoke pipe, thereby increasing the draft.

(14) J. P. says: I am burning slack under my boiler, and my tubes want cleaning two or three times a week. I am thinking of blowing them out with steam. Will the steam injure them by corrosion? A. No. This is ordinarily a very good plan.

(15) C. S. A. asks: I am using a wire rope, with a windlass and pulleys, subjected to very heavy strain. The rope seems to get stiffer from use. If I heat it red hot and let it cool slowly, it will be more flexible: but will it injure the rope? A. Not appreciably.

(16) B. F. G. says: We are burning Gross creek coal; it is very soft, and very much like the ordinary blacksmith's coal, but is of a high grade. We find that in wet weather we burn more in weight than when dry. A few days ago I weighed very carefully 500 lbs., dry, and afterwards added ½ gallon of water. I then reweighed it, and found that it had gained 20 lbs. I spoke of this experiment to a friend, and he said that it was impossible for it to gain 20 lbs., as the only weight that the coal could gain would be the weight of the water. Am I or is my friend right? A. Even in the face of the very stubborn facts that you present, we agree with your friend, and question the facts. 2. What is the weight of 1 gallon of water? A. A United States gallon of water weighs about 8·3 lbs.

(17) A. F. C. asks: 1. What would be a safe pressure to carry on an upright tubular boiler 15x20 inches, having 52 one inch tubes made of three sixteenths iron? A. A safe pressure would be 100 lbs. per square inch. 2. What would be the bursting pressure? A. About 600 or 700 lbs.

(18) H. K. asks: 1. What, in your opinion, is the best and cheapest method of preventing incrustation in steam boilers? A. In some special cases the tannate of soda seems to act beneficially. 2. What do you think of steam heaters and filters to prevent scales in boilers? A. In general we recommend the use of a good heater and frequent blowing. 3. What is mostly used in the East to keep the boilers clean? Is the water in the Eastern States generally impregnated with lime? A. The water used in boilers at the East ordinarily gives as much trouble from scale as that at the west.

(19) J. C. M. says: With the intention of increasing the capacity of a steam boiler (horizontal, 42 inches in diameter and 18 feet long, with 32 tubes), I introduced some 4 inch tubes under the boiler, commencing just behind the bridge wall and running back the length of the boiler. These pipes had cast iron connections at the bends. I placed them 8 inches below the bottom of the boiler, connected them at the back end of boiler near the bottom, and attached the feed pump near the front, and fed with hot water. The first day they worked well and improved the boiler greatly in steaming capacity; but on the third day, just after starting up, with the first stroke of the pump, the cast iron end on the pipe where the feed pipe was connected burst with a loud report, and for a few seconds nothing but blue steam escaped, and finally water and steam. Thinking the trouble was in pumping in water so near the fire and bridge wall, I changed the connection, putting the feed pipe into the mud drum, and then letting the back connection stay as it was, making a series of circulating tubes. On firing up this time, I was alarmed by a succession of concussions or jars in the boiler that shook the walls; but by firing slowly, we got up steam without any accident. In an hour or two we noticed that the tubes nearest the fire and bridge wall were red hot, and blue steam was escaping from the joints of the connections on the ends of the tubes. We drew the fire and removed the tubes. We found a great improvement by the use of these tubes, and did not like to abandon the use of them. We are at a loss to account for the phenomenon of blue steam being where we expected nothing but water. What is our remedy? A. The trouble seems to have been that the pipes got so hot that they made steam faster than it could be carried off, the circulation being imperfect. It will probably be necessary to use larger pipes, or to discard the return bends, to make the present arrangement successful. The same trouble has occurred with some forms of sectional boilers, whose use has been abandoned on account of the poor circulation.

(20) S. J. P. asks: I have a telegraph instrument, which I wish to attach to a railroad line. Will it work without a relay? A. Not on the main line. A relay will cost about $16.

(21) M. R. H. asks: How can I prevent beech wood lasts, subject to a temperature of 200° Fah., from being affected by the heat? A. There does not appear to be any way to do this, better than well seasoning and drying the wood before using.

(22) H. R. R. asks: A rectangular wooden tank lined with zinc is used in the second story as a reservoir for rain water. Since its erection, we are told that the zinc will soon corrode and the vessel become useless. Is there any way to preserve it, by paint or otherwise? A. The zinc becomes coated with a white oxide which washes off with the water, and by repetition of this process the metal is reduced in thickness and strength. There is a slate paint for application to iron tanks which might be serviceable when applied to zinc.

(23) A. B. C. says: "We have just started a new steam pump in a mine, at 700 feet level. To prevent the steam from exhausting in the shaft, a pipe was fixed to convey it into what we call the suction pipe, and the connection at the suction pipe was a globe valve or chamber, as the valve was taken out, and the exhaust pipe inserted in its place. This was the engineer's plan. I said that I did not think it would answer, as the chamber or pipe where the exhaust steam meets the water was too small, and the steam would cut off the water, or at least some of it; and it so happened that, when they started the pump, it would not pump ⅓ of the stream it ought to, which proved my words true. He took it away from there, and put it to exhaust in a wooden pipe which brings air down to the bottom of the mine, and it would be just as well if he let it exhaust right in the shaft as in that pipe; for the air strikes it, and it condenses, and as a matter of course fills the shaft with smoke. Now I think I can put the exhaust steam into the suction pipe so that it shall work all right. My plan is to have a larger and a more suitable connection with the suction pipe. Do you not think this will answer? The reservoir stands about level with the pump. The suction pipe is of 4 inches diameter." A. You are just entering on a field in which a great deal of money has already been spent for experiments, namely, condensers for steam pumps. The matter has already been worked out practically, and we think your cheapest and most satisfactory plan would be to obtain a condenser.

(24) J. McD. asks: Your article headed suction in your issue of December 5 leads me to make the following inquiry: Suppose a vessel be filled with water, and there be placed in the top of said vessel a tube extending upwards for fifteen feet, and there be attached to said tube two stop-cocks, one at either end. If the lower cock be closed, and the air be exhausted from the tube, after which the upper cock be closed and the lower opened (allowing free access to the tube for the water), will the water rise into the tube from the vessel? A. Yes.