Machinery and Tools as they are.—Screws and Screw Cutting.

(Continued from page 155.)

The present generation, standing on the vantage ground of scientific knowledge, are too apt to contemn the laborious researches of the past seekers after truth, forgetting that the heights of science, whence they extend their gaze, were raised by the accumulated toil of ages now gone by, and that, moreover the science of the present will, perhaps be only the ordinary knowledge of the future. Actuated by such a feeling as that alluded to above, the first impulse is to smile at a mode adopted only fifty years since, for screw cutting, when the thread was traced first on paper, then the lines tranferred to an iron cylinder, and a guiding thread having been cut by a chisel and file, the operation was completed by a fixed cutter. Yet this rough plan was at that time regarded as the climax of ingenuity, and was carefully described for imitation; in truth it was a great advance over the previous methods, and its importance is increased ten-fold by the supposition that it was intended for the "boring-bar," then just invented, and which has so effectually superseded the boring machine previously used for engine cylinders, which boring machine was simply a boy who scrubbed the rough casting with a piece of pumice stone. To a person unversed in mechanics, the stress laid upon the necessity of obtaining excellence in screws may appear absurd and pedantic, but those most conversant with the subject, are also the most precise in their requirements on this point. A few words will explain the reason for this discrepancy of opinion; when a screw is employed merely to bind or attach one body to another, such exactness of workmanship is not required, and whether the pitch of the thread has any exact relation to the *inch*, is a matter of indifference as regards its individual usefulness. But in screws of a superior kind, or those which are termed "regulating" and "micrometrical," it is not alone sufficient that the screw shall be good as respects its general character, and as nearly as possible a true "helix" (a word denoting the peculiar shape of the screw), but it must also bear some defined proportion to the standard foot or inch, or other measure. This will be understood by explaining that micrometrical screws are employed in engines for the graduation of right lines and circles, and likewise for astronomical and mathematical instruments. In these latter the requirements of science appear ever to outstrip the most refined methods of execution, and a single instance will give an idea of the indefatigable perseverance with which some individuals have pursued this object. About the year 1800 two eminent mechanicians undertook to reform the old, imperfect, and accidental practice of screw-cutting, and succeeding in the attempt, have introduced the exact and systematic mode now generally adopted. As a preliminary proceeding, it was necessary to cut a very exact screw; each of them, therefore, cut a similar screw, 15 inches long, by a distinct process, and the two having been compared, they were found to agree exactly, but on being examined by a powerful microscope, these screws were discovered to be exceedingly defective. This rigid scrutiny led both parties to fresh and ultimately successful efforts. Without, however, entering into an account of the complex arrangements, by which such results were obtained, it will be more advisable to recur to the method adopted by hand turners to cut a screw, as their mode of procedure, perhaps, imparts most simply to the inexperienced, the theory of the subject.

All elementary works on mechanics tell us that the screw consists of an inclined plane wrapped around a cylinder; or, in other words, that it is a continuous circular wedge. These definitions afford an index to the manner in which a screw is made, for the turner, having formed a piece of metal to a cylindrical shape, next proceeds to cut the thread. This he does with a "screw tool," which is a straight flat piece of steel having projections and recesses exactly corresponding to the thread, but previously he "starts the thread," that is, lightly traces on the cylinder, as it revolves, a few threads similar, as near as possible, to the pitch of the screw he is to form, then stopping the motion of the lathe, he carefully examines his work to note the correspondence of the pitch, and if not sufficiently correct, he effaces the spiral mark he had made, with a turning tool, and commences *de novo*. If correct, however, he grasps the "screw tool," and presses it against the cylinder, which is rotating before him, in such a manner that the teeth or projections of the former touch the spiral line he had lightly cut, the incision being sufficiently deep to give a tendency to the "screw tool" to follow the course of the spiral. This inclination the workman encourages by a light pressure in the longitudinal direction, whilst, at the same time, he maintains the tool in a position favorable for deepening the incision in the cylinder. When the tool has traversed as far as it is intended to cut the screw, it is withdrawn from the work and again placed in its first position, which process is continued until the thread is cut as deep as desired. Had the screw tool been held at rest it would have made a series of rings, but no spiral, as many an amateur has found to his discomfiture. Should the tool fail to drop exactly into the groove at the commencement of the process a tolerably good screw may nevertheless be formed, as the error can be rectified. But if the difference should happen to be great, the tool finds its way into the groove with an abrupt break in the curve, and this error is often beyond correction. Should the tool be moved too rapidly, a double thread is sometimes the result, if too slowly the screw has only half the inclination intended, and the grooves are as fine again as the tool. The assemblage of points in the "screw tools," proper for metals and hard woods, renders the striking of screws in these materials comparatively certain and excellent, but the soft woods require tools with very keen edges, and therefore the "screwtool" is made with only a single point. With a tool thus constructed, no skill could cut a correct screw, unless a lathe with a traversing mandrel were used when guide screws are fitted as rings to the extreme end of the mandrel, and they work in a plate of brass, which has six scollops or semi-circular screws upon its edge. It will be understood that the tool remains stationary, whilst the work, which is chucked traverses with the mandrel, whose motion is determined by the above-mentioned guide screws. The alternating motion is effected by giving a swinging movement or partial revolution to the foot wheel, but the use of this arrangement is limited to a few trades. The self-acting screw-cutting lathe is the best machine for cutting accurate screws of considerable length or of great diameter. In this lathe, the traverse or longitudinal motion of the tool is effected by a long guide screw, which revolves in bearings and gives motion to the slide rest.

The screw receives motion from the mandrel by the intervention of geared wheels, so that the traverse of the tool is regulated by the number of revolutions of the mandrel. This affords a simple means of obtaining a screw of any desired pitch, for it is only requisite to regulate the ratio between the revolutions of the screw, and those of the mandrel, to obtain any desired result. This latter purpose is effected by changing the geared wheels, and therefore every lathe of this description is furnished with a number of "change wheels." The accuracy of the result now depends almost entirely upon the perfection of the guide-screw, which should possess, very exactly, some whole number of threads per inch, for, in fact, every screw cut by its aid is either a reduced or enlarged copy of its merits and defects. It will here occur to the reader, that if only a pair of wheels were used to move the guide-screw, its direction would be the reverse of that of the mandrel and work, for adjoining wheels always travel in opposite directions, but by introducing one or two intermediate wheels, either right or left-handed screws may be cut. The screw or chasing tools employed for this lathe resemble, generally, the fixed tools, except as regards their cutting edges. Angular screws are sometimes cut with a single point tool, the general angle of the point being from 55° to 60°, and when it is allowed to cut on only one side or bevel it may be used fearlessly, but if both sides are allowed to cut, more caution is required; for angular threads it is more usual and expeditious to employ a chaser. For square threads, a rectangular-shaped tool is general and the end alone is used to cut, a side tool being sometimes employed to regulate the width of the groove; there are, however, a number of peculiar tools and modes of working adopted according to the exigency of the case or the fancy of the workman.

(For the Scientific American.)

Locomotive Invention---White's Truck.

In No. 17 of the "Scientific American," I find an article, under the head of "White's Patent Railroad Truck,—A Defence." I have no wish to engage in controversy with Mr. White or others, but simply to give my opinion on what is stated to be his invention, for when an invention is brought before the public it is open to criticism; and I must say, after reading his defence, that I am of the same opinion as before, and will endeavor to give reasons for it; in the first place, moving the eccentric cup to one side does transfer the weight of the locomotive so much to one side of the centre of the truck, by moving the centre pin with the longitudinal groove, which is the centre upon which the truck vibrates in order to accommodate itself to vertical inequalities in the track, so that whenever this centre is moved to one side, the weight upon two of the journals is greater than upon the other two, and, as I stated before, if moved much to one side, it would tend to cause the result it is meant to avoid. If the centre-pin, about which the eccentric cup is moved, was a part of the saddle, in place of the saddle resting upon it in the groove, then it would be free from this objection. Mr. White speaks of the loss that might result from taking a locomotive into the shop, in order to move the centre-pin, and the loss that might result in losing a trip in consequence, I will ask if the loss of time would not be much greater in substituting his apparatus in place of the ordinary centre. Mr. White would have us believe that the success of his truck is in consequence of his movable centre, and he does not tell us that the trucks, for which he substituted his, had side bearings, carrying the locomotive upon four, in place of three points, hence their liability to run off the track upon the Blossburgh road, any centre-bearing truck would have answered, and with such his truck ought to be compared, and not with such as are not calculated for even roads. Mr. White speaks of wedges in the pedestals, now the only proper use of such wedges is to adjust the driving axles, so as to get them perfectly at right angles with the cylinder, and to take up any play which may arise from the wear of the boxes and keys, and throwing the axles out of position by the wedges, in order to make the engine track, is like making two wrongs to make one right. The metaphor which Mr. White uses, about its not being prudent to carry five hundred pounds pressure of steam in a locomotive boiler, is strange; he says, "but it does not follow that because five hundred lbs. would tend to burst the boiler, that ninety or one hundred pounds may not be used with safety." It is like saying, well, if it would be unsafe to move the centre much to one side, moving a little wont do any harm; but allow me to ask if the centre-pin, being out of place (say one quarter inch), requires so much machinery, must it not be a serious evil? and the moving the centre to one side, by transferring part of the weight which belonged to the other side, cannot but be objectionable. Mr. White does not say that he is the inventor of centre-bearing trucks; but one might, from his article, presume that he was; the gentleman to whom he alludes as knowing Mr. Hudson, and his truck (which he never called his) —knows that locomotives with centre-bearings are not new, and that Messrs. Eastwick & Harrison put some locomotives upon the Rochester and Auburn Railroad, having such trucks with eccentric centre-pins for making the engine track, and they were used on the above road several years ago, so that Mr. White's invention is restricted to the peculiar combination of the eccentric cup plate, centre-pin, and saddle, in connection with the centre-bearing truck.

From an inspection of the drawings and description of Mr. White's Truck, as exhibited in the "Scientific American," I think my remarks will be understood, and appear plain to all practical men. It will not be necessary to allude particularly to the extracts of the letters from Hiram W. Bostwick, Esq., and W. M. Mallory, as what I have said applies equally well to their remarks. "Honor to whom honor is due," is the motto of the "Scientific American;" and permit me to say that I am not actuated by any personal or selfish motive but simply to vindicate the truth. Hoping that this will be satisfactory, I remain,

Yours, &c. W. S. HUDSON.

Paterson, N. J., Jan. 10, 1853.

How to Calculate the Power of Parker's Water Wheel.

The following article presenting the *modus operandi* for calculating the power of the Parker Water Wheel, is from J. Sloan Esq., of Sloan's Mills, of Floydsburgh, Shelby Co., Ky., who since we referred to his correct and extended information on this subject, on page 336, Vol. 6, Scientific American, has had many letters sent to him for information. This, it is hoped, will give all the knowledge required by future inquirers.

"My manner of computing the power of the Parker wheel is as follows, for a wheel of 150 square inches area of issues, and 3 feet diameter, under 9 feet fall, viz., $9 \times 64 = 576$; $24 \times 150 = 3600 \div 144 = 25 \times 62{\cdot}5 = 1562{\cdot}5 \times 9 = 14062{\cdot}5$ actual power of the water in pounds, theoretically with the assumption; the discharge is through a fair common aperture in the atmosphere. Diameter of wheel in feet $\times 3{\cdot}1416 = 9{\cdot}4248$, then $24 \times 60 = 1440 \div 9{\cdot}4248 = 152{\cdot}89$ revolutions of the wheel per minute provided the velocity of the wheel is the same as the water. The result of repeated experiments I have made, proves the helical sluice of the Parker wheel, retards the water as 33 is to 30·75, which must be deducted; thus, 33 : 30·75 : : 25 : 23·295 cubic feet per second the practical or real discharge of the helical sluice without the wheel. I also found the wheel retarded the water in the sluice as 30·75 is to 25·5; hence we have 30·75 : 25·5 : : 23·295 : 19·3145 cubic feet, the real discharge through the wheel measured in the tale race, on the principle laid down by Du Bauts for measuring running water. I found it safe to allow the wheel's periphery to move 7 per cent. faster than the velocity of the water, a practice of 20 years' standing.

The Franklin Institute, in their report, 11th June, 1846, assert that a Parker wheel, under a fall of 10·10 feet, made 166 revolutions per minute, and the mechanical effect was 71 per cent., with 1110 cubic feet of water per minute; $10{\cdot}1 \times 64 = 646{\cdot}4$; $25{\cdot}424 \times 60 = 1525{\cdot}44$ the theoretical velocity of the water per minute. The diameter of wheel, $36{\cdot}5 \times 3{\cdot}1416 = 114{\cdot}668 \div 12 = 9{\cdot}55$ feet, the circumference of the wheel. Velocity of water $1525{\cdot}44 \div 9{\cdot}55 = 159{\cdot}73$ number of revolutions of the wheel per minute, provided the velocity of both were in unison. The wheel made $166 - 159{\cdot}73 = 6{\cdot}27$ revolutions of the wheel more than the velocity of the water theoretically. The area of inlet and issue of the wheel was 150 square inches $+ 1525{\cdot}44 = 229816 \div 144 = 1595{\cdot}944$ cubic feet per minute theoretically, 685·944 cubic feet per minute more than the actual quantity."

Spot on the Sun.

A writer in the "Delaware Republican" calls attention to an unusually large spot on the sun, which may be seen through smoked or colored glass. The writer adds:—"By a rough measurement of the present spot, I found its diameter to be about thirty three thousand miles, consequently occupying an area on the sun's surface of eight hundred millions of square miles, equal to four times the superficial contents of the earth. The spot was visible this morning, and quantities of smoked glass were called into requisition in consequence."

Spots on the sun are very common; we remember to have seen three large spots on the sun's disc in the summer of 1836 (a very wet one) for at least three weeks. These spots are supposed to be less luminous parts of the sun's atmosphere.

A beautiful fire engine has been built by J. Smith, of this city, for the town of St. Andrews, New Brunswick Province.

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