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**THE SCIENTIFIC AMERICAN SUPPLEMENT**

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## THE GREELY EXPLORERS AT HOME.

It was on the 17th of July that the telegraph brought the news of the return of the Greely relief expedition to St. John, N. B., with Lieut. Greely and five of his companions who were rescued alive, and the bodies of twelve who had perished. Since then, with the more full details that have been furnished, the general sentiment of the country has strongly expressed itself in words of earnest commendation for both rescued and rescuers. The steamers composing the relief expedition, the Bear, Thetis, and Alert, were ordered to remain at St. John until metal caskets could be obtained for the bodies of the dead, and then to come homeward gradually to more southern latitudes, so that the yet feeble survivors might not be suddenly exposed to extreme warm summer weathe.

In accordance with this plan, the first official reception to the returning party on United States soil was given at Portsmouth, N. H., Aug. 4. There was a procession, in which Lieut. Greely was too weak to take a part, but which he reviewed from a balcony, and speeches were made by Secretary Chandler, Senator Hale, Representative S. J. Randall, Commander Schley, and others. The scene was an affecting one, and the exercises were marked by a simple dignity well according with all the circumstances of the occasion, Secretary Chandler concluding his address by saying: "To the rescuers and the rescued are these receptions most fitly given, and we are here assembled to do them honor; but our first duty is to pay our tribute of praise and of mourning to those devoted men who, after months of suffering and starvation, borne with heroic fortitude and patience, perished as truly on the field of duty as if they had met their fate at the cannon's mouth."

Lieut. Greely, in a letter which was read, bore strong testimony to the energy and skill of Commander Schley and the officers of the squadron, who so determinedly pushed their vessels through the ice packs to Cape Sabine earlier in the season than was ever before accomplished, adding: "Had they known our exact condition and locality, they could not have reached Camp Clary in time to have saved another life." In view of the blundering management of the former relief expeditions, however, the following portion of Lieut. Greely's letter must seem almost like grim sarcasm to the officers who had charge of them: "Never for a moment, in our darkest or gloomiest hour, did we doubt that the American people were planning for our rescue, and from day to day, as food failed and men died, that faith and that certainty gave strength to us who lived."

The business of the relief ships was formally ended on the 8th inst., when the remains of the dead were formally delivered by Commander Schley to General Hancock, at Governor's Island, New York. Each of the caskets was placed on an artillery caisson, and a column thus formed, the military with arms reversed, the band playing a dirge, and minute guns being fired, the procession moved to the hospital, where the bodies were left for final disposition according to the wishes of the friends or relatives of the dead heroes.

## SCREW BOLT HEADS.

While machine screw heads are of the solid metal from which the shanks of the screws are turned, most of the screws and bolts used in woodwork have their heads struck up cold, as are those of rivets and of nails, or else hand forged or machine forged from the red hot bar. Rivet-made heads are necessarily made at one blow, the metal being cold, and to such an extent has this possibility of work been carried that bars of Norway iron, seven-eighths of an inch diameter, are worked cold into headed bolts, a single blow forming a head one inch and a quarter diameter. The amount of heat generated by the blow necessary to instantly change the direction of the fiber of the iron is such that the dropped bolt cannot be handled with bare hands for some time after its formation.

If the heat thus generated could all be utilized and concentrated on the head formation, the result might be something approaching a weld, and the head be a solid. But these rivet-headed bolts are not solid headed; the fibers of the straight bar are "broomed out," like the rays of a mushroom, without solid connections. This is caused partially by the suddenness of the change from perpendicular to transverse, and partially by the dissipation of the heat engendered by the blow, which is conducted from the rivet itself to the die and its surroundings.

When these heads are formed by successive blows while the iron is hot the result is somewhat different, as the fibers are gradually bent to the new direction, and near the shank they are partially welded. The heads of boiler rivets are generally welded, being brought to form under a white heat. But in the attempts to form heads by upsetting, it may be questioned if the violent redirection of the fibers of the iron in the cold rivet heading, or the slower bending of the fibers in the repeated percussion of the hammer while the iron is hot, retains the original tensile strength of the iron. It is certain that with the increasing diameter of the formed head from that of the original shank, the fibers of the iron must be forced apart, and consequently they must become less coherent as farther apart they go.

Machine screws generally are made on an entirely different principle. Instead of the shank being the original of the diameter of the screw, the head is taken as the measurement, and the difference between head and shank is turned off into chips. At first sight it would seem that there is a very great waste of material to produce the required result; but as an offset to this is the fact that the rapidity of manufacture compensates for much of this loss, and the uniformity of the product is particularly desirable. Beyond this is a claim made by thoughtful mechanics that the undisturbed relation of the fibers of the iron in head and shank is a source of strength.

However this may be, it is certain that the Spencer system of producing machine screws excels in rapidity, in exactness, and in uniformity of the product. The waste brings back more than half of the first cost of material, and at least seventy-five per cent of the oil used is saved by means of the centrifugal machine.

## STRAIGHTENING SHAFTS.

Managers of machine shops and foremen of men sometimes allow shop practices that are ruinous to tools and injurious to the mechanics themselves. One of the most frequent abuses of this sort is the methods of straightening shafts for turning in the lathe. A common practice is to suspend the shaft on the lathe centers, and then, with a bar, using the tool carriage or the vee-ways of the lathe for a fulcrum, spring the shaft with a powerful leverage. Of course, the centers and the two spindles of the lathe have to bear the brunt of this trying ordeal, as may be supposed to their detriment as accurate portions of an accurate machine. Perhaps a worse practice is that of striking the shaft with a hammer while thus suspended on the lathe centers. Hardly less injurious to the shaft itself is the straightening on the anvil by sledge blows, the projecting ends of the shaft being left unsupported; it has been demonstrated by tests that the vibrations caused by this treatment diminish the torsional resistance of the bar. If a bar or shaft is to be straightened cold on the anvil, the ends of the bar should be supported on wooden horses. For short crooks in the shaft the hammer straightening should be preceded by heating to a "black" heat.

The proper way to straighten a shaft is the obvious one, by pressure—screw, or cam, or lever pressure. A frame with ways like those of a lathe can be made, either of iron or wood, to receive two head stocks with centers, one of the centers or both of them to be projected and retracted by a screw and hand wheel, as is the center and spindle of the ordinary lathe foot stock. If the frame is long enough, a supplementary double head can also be used between these two, having a center at each end, so that the process of straightening two short shafts may go on at the same time.

There should be a sliding carriage to traverse the ways between the heads, carrying a horse-neck screw press, and two vee-scored blocks, which can be moved nearer together or farther apart as the crook in the shaft makes necessary. The operation is simple. The shaft, having been centered by its ends, is suspended, and its "outs" ascertained and marked by rotating by hand and marking with chalk. Then, released from the centers, it rests on the carriage, which has been moved to one of the chalked points. A turn of the screw, the lower end of which is provided with a shallow vee-scored block that swivels on the screw, gives a pressure between the sliding vee-scored blocks on the carriage, when the carriage is moved to another chalked spot, repeating the same performance. The carriage is held to the ways of the frame by hooked clips that are attached to it, or it may be held in place by a bolt, bar, and cam, or wedge lever, as is the foot stock of some lathes.

With this contrivance two men can do a large amount of accurate work very rapidly. The rapidity of the work may be increased by substituting a cam lever for the screw, on the same principle as the lever used in bending and straightening railroad rails.

## STEEL TESTS.

So many are the varieties of so-called steel nowadays that it is difficult to have a test that shall apply equally to all. But for tool steel its quality can be readily assured by a common smith's test. It should be understood that steel for tool purposes—for the cutting of the metals particularly—should be a composition capable of being hardened and drawn to temper. To be sure, it is claimed that there is suitable tool steel for certain cutting purposes that leaves the smith's hammer in good condition for use. It may be so, but it is evident enough that the proper condition of this steel depends upon its manipulation, and as that is less or more, the steel varies in resisting and durable qualities in use. Chrome steel and Mushet's steel are both valuable for certain purposes, but it is not always known when the proper quality or condition for these certain purposes is reached. Mechanics generally will prefer to guide the coming to condition by their own judgment, rather than to trust to the exactness of the manufacturer in proportioning the components, properly mixing them in a melted state, and afterward working the resultant.

The old-fashioned method of testing tool steel is as good a practical method as that of a careful chemical analysis. It is simply the heating and drawing under the hammer to a slender point, plunging while red hot in cold water, and when chilled striking it with a hammer across the edge of the anvil. If the steel will harden it will break, under these conditions, without bending back and forth. Steel that will not harden under these conditions is not fit to temper and will not retain a cutting edge. Steel that is so "high" that it cannot be heated red hot and chilled in water without flying may do for some purposes, and retain a sufficiently rigid edge by air hardening. If a piece of steel can be forged into a cold chisel, be hardened, tempered, and used, such steel is good steel, and may be relied upon for all ordinary shop purposes.