Mechanics.

A NEW PISTON PACKING.

A paper was lately read before the Institution of Engineers and Ship Builders, of Scotland, by John Turnbull, jr., in which Lockwood's new piston packing was referred to. This packing has a spring ring, designed to press the packing rings outward against the walls of the cylinder, and at the same time to press the rings apart against the flat faces, each motion being independent of the other. In plan, it represents a series of contiguous segments of a circle, and in section a single segment of a circle. It is made of steel wire equal in section all through, and in one piece for any diameter of cylinder, thus rendering it equally elastic at all points. The ends are secured together by means of a double-ended bolt, having a solid washer between; and the bolt is made long enough at both ends for additional washers being put on at any time after the ordinary tear and wear of the cylinder and packing rings requires increased tension on the spring ring. The latter is considerably lighter than both the ordinary cast-iron or the helical coiled spring rings. The packing rings have a continuous cavity round their outer circumference, not so much to reduce the friction as to form a receptacle to retain the lubrication and moisture from the walls of the cylinder. Such an arrangement is especially suited for engines having separate exhaust ports, and whose cylinders are horizontal. The inner edge of each packing ring is made parallel for some distance toward the faces, so that the spring ring can enter easily and without any compression; while by the gradual screwing up of a junk ring, the packing rings are brought closer together, and permitted just to touch each other by their inner edges and not to press unduly. During the operation of screwing up, the packing rings are gradually distended by the points of the spring ring acting on an inclined plane, until it comes upon the protecting flanges, when compression downward begins. After the junk ring is firmly screwed up, a hoop-iron gland may be applied round the packing rings to draw them into the diameter of the cylinder, so as to enable them to enter. The gluts or tongue-pieces are made the whole of the width of the face, so that they cannot get out. In the discussion which followed, several engineers present gave the results of their experience, which was pronounced to be favourable.

RENEWING BURNT STEEL.

It is generally believed that steel, when once burnt, is absolutely unfit for any purpose whatever, and it seems a difficult matter to convince people that such is not the case. Messrs. Bauer & Co., of New York city, have for some time been engaged in accumulating proofs to the contrary, and show that with the aid of "steeline," a compound which they prepare, burnt steel may be restored, and that, in fact, overheating of steel and subsequent cooling in steeline offers many advantages in working. We witnessed recently some experiments made with the compounds which prove its efficiency. One end of a steel bar was heated and tempered in the usual way, exhibiting a good fracture, the other end was then burnt, cooled in "steeline," an oily, semi-fluid mixture, heated again to a somewhat lower heat than usual, and then cooled in water. A fracture of the burnt steel showed the open granular fracture which would lead to its immediate condemnation, while the same burnt material, after treatment, had all the characteristics of a steel superior to the metal originally treated. We are assured by a firm, whose reputation ranks among the highest in this country, that they found the steel work easier by its application, and that it is less liable to break in hardening. Messrs. Bauer & Co. have commenced an interesting series of experiments looking to the use of ordinary Bessemer rail steel for cutlery, saws, files, etc., by a treatment with "steeline." They have succeeded thus far in obtaining creditable results, having made files, saws and knives which rank well. From better qualities of steel they show excellent specimens of springs, so that the results thus far are very encouraging, and may be considered as strong proofs of the correctness of their method of manipulating steel, strongly at variance as it may appear with accepted notions.—*Iron Age.*

CARE IN EMPTYING STEAM BOILERS.

In regard to emptying and blowing-off steam boilers, a French contemporary gives the following useful hints: "those who possess externally-fired boilers, working only by day, have all observed that the fire being covered by night, and the doors closed, the pressure rises during the night, often sufficient to open the valves. This shows that the masonry, being at a much higher temperature than the boiler which it envelops, imparts to it some of its heat. The same effect of heating the boilers is produced, to a less degree it is true, but nevertheless to some extent on the outer jacket of internally-fired boilers. It is, consequently, injurious to empty boilers soon after having stopped them, because after emptying, the plates would be heated by the action masonry. It is well to admit a current of air through the flues some hours after the stoppage of the generator, and not to empty it before the flues become cooled to a temperature below 300°. When the flues are not too hot, no serious inconvenience is experienced in emptying the boiler under pressure. We do not say at high pressure, as for a boiler the pressure of which would be 10 pounds, the temperature of the water being 304°, a greater quantity of steam would be generated during the process of emptying; we think at a pressure of two pounds the boiler could very well be emptied. In internally-fired boilers, as there is no masonry to cool in the furnace tubes, it would be well to admit the current of air intended to cool the masonry behind the boiler, as in this case the furnaces would be cooled more rapidly than the jacket. We have sometimes seen owners empty their boilers almost immediately after the fires have been extinguished, clean them with cold water as soon as they were empty, and keep up a current of water so that the workmen might work there. Boilers of small dimensions sometimes resist such treatment, but in large boilers it will be seen that unequal contractions must take place, causing the rivets to burst."

PHYSICAL CHANGES IN IRON AND STEEL.

Amongst the many questions that have been discussed in our columns are those relating to the hardening and tempering of steel, the expansion of iron with increase of temperature, the changes it undergoes between the molten and solid state, and the phenomenon of a piece of solid iron floating in a bath of molten and necessarily less dense metal. Lately some elaborate and instructive experiments have been made by Mr. Thomas Wrightson, of Stockton-on-Tees, with the view of determining (1) the changes in wrought and cast iron when subjected to repeated heatings and coolings; (2) the effect upon bars and rings when different parts are cooled at different rates; and (3) the changes occurring in molten iron when passing from the solid to the liquid state, and *vice versa.* The results were embodied in a paper read before the Iron and Steel Institute, which, with the tables and diagrams accompanying it, will take first place in the literature of the subject. It contains, in fact, the only really scientific attempt to settle some of the mooted points that, as far as we know, has been published, and it is to be hoped that it will be issued in a separate form after it has appeared in the transactions of the Institute. The reason that so little has been done hitherto in the accurate observation of the physical properties of iron is twofold—first, the molecular changes of the metal is so slow at ordinary temperatures, and under ordinary conditions of strain, that trustworthy observations, which must of necessity have extended over long periods, are difficult to obtain; secondly, when the temperatures are high—at which times the greatest and most rapid molecular changes are occurring—the difficulties of observation are increased to such an extent that the results lack the scientific accuracy which characterise the chemical methods of examining iron. Hence, probably, chemical analysis has been employed almost to the exclusion of physical methods. However, to take the first heading, the changes effected by repeated heating and cooling, we have only to point to a steam boiler to see how important it is that we should understand these charges not only as they affect iron, using the term in its generic sense, but also as they affect the different qualities and various makes.

In the case cited we have one side of the plates subjected to a fierce heat, while the other is at a comparatively moderate temperature approximating to that of the steam and water. Where a riveted seam occurs the conducting surfaces of the metal are thickened, and the results are not unfrequently seen in what are known as seam rips. Mr. Wrightson cut some strips from the plates of two long egg-ended boilers which had exploded by ripping at the seams, and found the iron had become brittle, was apparently crystalline in fracture, and had but small tensile strength. Strips taken further from the seam showed that in both cases the iron had been less injuriously affected. Chains are rendered brittle by the strains to which they are alternately subjected, and they are periodically annealed to avoid any danger from the change in the tenacity of the iron. Mr. Wrightson found that a similar treatment of the strips from the boiler-plates restored the fibrous character of the iron, as well as its