safer. He was once standing over a boiler on a Mississippi boat when it burst. The deck was raised, but not entirely destroyed, and the steam came up and scalded many. He saved himself by running into his stateroom and holding a blanket over the door, to exclude the steam. His hands were scalded, but he was not otherwise hurt; but many were killed by inhaling the steam. Mr. Miller, an engineer on another boat, escaped from the steam by throwing himself down and holding his cloak over his face. In both these cases, had the boilers been aft and the passengers forward, the steam would have been carried astern by the current of air due to the speed of the boat. Except when the wind is abaft, this proposed arrangement would promote safety. In these cases all the damage to persons was by steam scalding, which would not have happened had the boilers been as far aft as practicable.

It was suggested by Mr. Selleck that if the boilers were corrugated, as proposed by Mr. Montgomery, there would be less danger of rupture by strains from inequality of temperature: the corrugations would yield by flexure.

Mr. Fisher repeated his opinion, several times stated before, that the boilers made up of water tubes, with small connections, which long ago had been found safer than all others, ought to be fairly tried on a large scale, whatever may be their probable cost; the costs of their use thirty-five years ago were not so excessive as to deserve a moment's consideration in cases where hundreds of lives are concerned. This view appeared to be generally applauded.

There was no general agreement among the speakers in this long discussion; each had his remedy; some were for punishing engineers and captains, others lor compelling proprietors to pay a large sum for every person killed or injured; others were for contrivances to keep the water high; others had theories of electricity, decomposition of water, and gaseous explosions; others suspected that deäerated water caused explosions; and each seemed to hold his own opinions at the end of the discussion.

Mr. Wiard, who has done much of the talking, is the only one who has made experiments. He invited the members to call at Mr. Plass's shop, 110 East Ninth street, New York, to witness the performance of apparatus which he had fitted to a boiler to prevent undue heating of the steam, and consequent excessive and dangerous heating of the plates.—*American Artisan.*

Hydraulic Forging Press.

We translate the following article from *Le Moniteur Industriel.*

Mr. Haswell, superintendent of the Austrian Railway Company's machine shop at Vienna, has constructed a hydraulic press to serve instead of a steam hammer in forging crank axles, connecting-rods and other heavy forgings for locomotives. The steam hammer, although a great improvement on previous means to forge heavy masses, has certain inconveniences: it does not work uniformly on the mass; the exterior parts directly struck absorb the useful effect to the detriment of the interior parts, which are not compressed by the blow. The welding of the interior parts is consequently incomplete, and the effect of the hammer is sometimes to shut in the scoriæ instead of expelling them.

When the welding is effected and the shaping is to be done, the steam hammer does not work with accuracy, and sometimes strains on the welds. The iron, unequally worked in different parts, has different degrees of strength, which may be the cause of accidents. Finally, the violent blows of the steam hammer produce vibrations which, many times repeated, cause pernicious alterations in the molecular structure of the iron.

Now, in the welding, as in the shaping of a forging, a gradual pressure is more effective to unite and weld the parts, and to force them into shape. For this reason Mr. Haswell uses the hydraulic press, which, with sufficient power, has a great facility of manouvering and rapidity of action. The machine of Mr. Haswell is used successfully in the shops of the company in forging connecting-rods, crossheads, pistons and rods in one piece, crank-axles, etc.—*American Artisan.*

Effects of Heating, Rolling, Hammering and Annealing Metals.

Elaborate experiments and careful observations have developed many interesting and important facts with regard to the variations of destiny, etc., which different metals undergo in different degrees in the operations of heating, drawing, rolling, hammering and annealing.

At a temperature rather above a cherry-rod, iron wire will remain three months, surrounded with charcoal, without cementation taking place, while a white heat will, in five minutes, render brittle a square bar of malleable iron, eight-tenths of an inch in diameter.

Wires of copper, and of alloys of copper and zinc, are increased in diameter, and diminished in density, by annealing. The operation of rolling condenses metals more than that of wire drawing. The density of iron and copper will be greater if the metals are heated before being passed through the rollers. The reverse in the case with alloys of copper and zinc. The density of metals is greatest when drawn into very fine wires. Hence, two small wires are stronger than one large one of the same transverse area with the united areas of the small ones. This result grows out of the fact that the particles of the smaller wires are compacted throughout their entire cross section, while those of the latter are thus compacted for a certain depth only.

Wires may be increased in length in two ways, first, by diminution in the case of its cross section; and, second, but only in a slight degree, by increasing the distances between the component particles. When wire is lengthened by the latter process, it returns to its former length by annealing.

Again, wires of certain different metals, after passing through the same hole in the wire-drawing plate, have different diameters, but all such subsequently acquire equal diameters during the process of annealing. The diameter of a wire is said to increase very slowly by time after passing through a wire-drawn plate. Wires which have been bent, and subsequently straightened have a tendency to re-acquire the same curvature by time.