slightly acid. This acidity may come from dissolved organic matter, which, if from fields or woody districts, the water is likely to carry in considerable amount. This woody extractive matter is easily decomposable, and some of the complex acids, so-called humic, crenic, apoorenic, oxalic, etc., present or formed under the action of decomposition, act very unfavorably on the iron of the boiler. This woody or especially peaty matter also contains tannic acid and gums in many cases, and has been observed to varnish the inside of boilers, in some places, so as effectually to prevent corrosion where otherwise it would be expected. The presence of certain salts in solution has a very injurious effect on boilers, even in small amounts. Waters containing nitrates and especially ammonia salts, as ammonia chloride, seems to be especially bad. Water exposed to the leaching from vaults is especially undesirable, even though a water strong in salt and alkalies from a common sewer might not be harmful to the boiler. The action of oil and tallow decomposing to oleic and margaric acid in the boiler, in the absence of alkalies, and especially with a coating of sulphate scale to prevent free circulation of the water at the corroding points, is well established. It occurs that a water at some seasons of the year making quite a scale, is at others quite soft and charged with air and gases, and partly dissolves that scale. This may go on indefinitely, until an unusually wet season, or a very clean or new boiler with the water quite pure, may suddenly develop injurious pitting from the absence of matter to counteract the effect.—*Dominion Mechanical and Milling News.*

HINTS ON HAMMERING.

A correspondent of the *American Mechanic* furnishes that journal with some very interesting notes on the use of the hammer on shafts, rivets, etc. We collate as follows:

The particular manner in which a piece of metal yields to a blow depends upon the hardness, the weight, and the speed of the thing with which the blow is struck. A machinist straightens a shaft by striking the high side with a heavy soft hammer; he straightens the same shaft by striking the low side with a light, hard hammer. The heavy, soft hammer acts more as a slowly applied pressure, or like a screw press, and takes out a bend by bending in the opposite direction. The light, hard hammer dents or penes, and in consequence lengthens the low or short side, which straightens the shaft. Now a shaft can be straightened with a heavy, hard hammer, if it be heavy enough to bend the shaft more in the direction that it strikes than it tends to pene the shaft in the opposite direction. For any given shaft there is a size of hard hammer that will pene in one direction as fast as it will straighten in the other, and without a change in tendency, a man may hammer the shaft and his lifetime away and accomplish nothing.

HAMMER RIVETING

Is merely a series of dents. The particular manner in which pieces are riveted depends upon the weight or pressure, and the speed of the thing that does the riveting. Before riveting machines were made, hand-hammers were used, which were often more effective than the operatives were efficient. Two blows of a 4-ounce hammer would shorten a rivet so it would be nearly or quite even with the piece that it was supposed to hold, but it would not be right, because its body would be enlarged the whole length and be only slightly tapering, a little larger at the end, but not enough larger to hold. Some experiments were reported to the correspondent by Mr. C. H. Norton, the inventor of a riveting machine, in which the inventor tried light hammers, weighing about 1½ ounces each, which formed heads on rivets of some sizes without enlarging the bodies; but these hammers were still too heavy for the smallest rivets.

Some of the 1½-oz. hammers were cut off at each end, leaving them one ounce, which proved to be light enough; but the operatives did not like to have them so light, because so many blows had to be struck to form a rivet head. When Mr. Norton was not near, the heavier hammers would be used by some operatives and the riveting would be worthless. Such stimulants to morality as are kept in workshops for cases in which a lack affects the employer, were administered. Reward was offered to informers, discharge was threatened to bad riveters. Another trouble came, not so much through lack of morality as through lack of skill. Among the pieces to be riveted one to another were many eccentric washers, called glass clamps, for holding glass plates, the edges of which were placed under the clamps while riveting. A wild blow, uneven hammering, or too much hammering, would break a plate.

The riveting machines afforded relief from all these troubles so far as the employer thought that his interest was concerned, though they did not, essentially, advance the operatives either in skill or in morals.

Before a successful machine was made it was found that the helve must neither be too stiff nor too heavy, but that it must yield somewhat when the cam strikes the lift. If the lift does not yield enough, it will wear away the cam almost as quickly as if turned in a lathe. One cam was destroyed in less than ten minutes.

If the helve and the hammer are too heavy, and, in addition, the helve is too stiff, the hammer, by one stroke of the cam, will be thrown so high that it will not come down before the cam has made several turns. If the hammer is not light enough, it will not answer to the spring quick enough to strike a blow that will do the work. Mr. Norton learned the curious fact that, within certain limits, the lighter the hammer the more work it will do. It is the quick blow of the hammer pulled down by the spring that does the work; if the hammer be too heavy, its inertia will be too great to be overcome by the spring quick enough to do any work in the fortieth part of a second. It would appear that, though the hammer is heavier than a hand-hammer for doing the same work, the blow is largely taken by the cam, and in consequence the work done upon the rivet is like that of a small hammer. A solid metal helve that was stiff enough was too heavy. A wooden helve worked well while it lasted, but it soon splinted. The thing that finally answered every purpose was a piece of gas-pipe about seven-eighths of an inch in diameter. The length of the strike of the hammer should be from one-eighth to one-quarter of an inch.

MIXTURES FOR BRASS CASTINGS.

An English paper gives the following as the proportions of the different metals used for brass casting in a prominent English locomotive works:—

Brass for side rods—Six pounds of copper and one pound of tin; to 100 pounds of this mixture add one-half pound of zinc and one-half pound of lead.

Brasses for driving boxes—The same as for side rod brasses.

Some master mechanics prefer harder brasses, and call for five pounds of copper and one pound of tin, one-half pound of zinc and one-half pound of lead.

Bells—Four pounds of copper and one pound of tin; to every 100 pounds of this mixture add one-half pound of zinc and one-half pound of lead.