### Notes on Iron and Steel.

Cast-iron and wrought-iron may be welded together in the following manner: Filings of soft cast iron are to be mixed and melted with calcined borax, and the mixture sprinkled on both the cast and wrought iron. These are to be then heated, when they may be welded the same as two pieces of wrought-iron.

Cast-iron may be case hardened by being rolled at a red heat in equal parts of powdered prussiate of potash, saltpetre, and sal-ammoniac, and by being then placed, whilst yet hot, in a bath containing 2 oz. prussiate of potash and 4 oz. sal-ammoniac in every gallon of cold water.

Homogenous metal, so called, is made by melting Swedish wrought-iron, cut into scraps, along with about 1 per cent. of powdered charcoal; 6 oz. of the latter being allotted to a charge of 40 lbs. of iron.

Iron is said to have been successfully welded after being heated by electricity to a dull red *in vacuo*.

The highly polished surface of Russia iron is produced by rolling it under great pressure while in a cold state.

To show that iron is converted into steel by the absorption of carbon alone, Mr. S. B. Rogers states that, a hole having been drilled in a lump of iron, some small diamonds were inserted and hermetically sealed up, and the iron then subjected to heat. It was by these means converted into steel.

Excellent steel may be made by passing purified coal gas over Swedish or other good wrought iron, at a high heat, The process, however, is an expensive one.—*London Engineer.*

### Notes on Steam Boilers.

The Admiralty marine-engine contracts stipulate for ·68 of a square foot of grate and for 18 square feet of heating surface per nominal horse-power.

Gum catechu is extensivly used in the United States for removing scale from the interior of locomotive boilers. It is found not to injure the boiler or tubes in the least.

The heat transmitting power of boiler tubes has been considerably increased by cutting their exterior surfaces into ridges like screw threads.

The Giffard injector will commence working, throwing a jet of water into a locomotive boiler, when the pressure of steam is so low as to be incapable of blowing the whistle. It will often start when the steam-gage pointer stands at zero, although, of course, in such case, the gage cannot be correct in its indication. Few high-pressure gages, indeed can be depended upon, to a pound or so, at the commencement of the scale.

Feed-water heating apparatus has been suddenly and violently collapsed on the sudden admission of cold water while the exhaust steam was passing through.

The whole ordinary pressure upon all the internal surfaces of a locomotive boiler of the largest class (including the tubes) is about 15,000 tons.

In some experiments recorded in Mr. D. K. Clark's "Recent Practice," it appeared that a single-riveted seam in ½-inch plates was only 40 per cent as strong as the whole plate, or 20 per cent as strong as a solid plate 1 inch thick; a similar seam of $\frac{7}{16}$-inch plate was 50 per cent as strong as the whole plate, or nearly 22 per cent as strong as a solid plate 1 inch thick, while a similar seam of ⅜-inch iron had 60 per cent of the strength of the whole plate, or 22½ per cent of the strength of a solid 1 inch plate, the ⅜-inch iron, when riveted, being actually stronger than ½-inch iron similarly riveted!

In the experience of the officers of the Manchester Association for the Prevention of Steam Boiler Explosions, one boiler in eight is found to become defective, every year, from corrosion alone.

The pressure of the air upon the safety valves of steam boilers varies with the pressure of the air upon all other objects. When the barometer is high, therefore, a boiler, of which the safety valve is weighed to a given pressure, will work stronger steam than when the atmospheric pressure is lower.

With large and heavily worked engines there is a disturbance of the pressure in the boiler at every stroke of the piston. A sensitive steam gage will always show this to be the case.

In many cases there is a sudden increase of pressure in steam boilers immediately after starting the engine. This occurs, no doubt, from the ascent of water upon some of the plates which have been heated beyond their proper temperature, as well as from the sudden conversion of water into steam by being raised in a divided state into intimate contact with steam already superheated.—*London Engineer.*

### Disinfectants.

Mr. W. Crookes, F. R. S., of London a distinguished chemist, in a reprort on the application of disinfectants, quoted in the August No. of this Journal, "gives the preference to tar acids (carbolic and cresylic) as, under all circumstances, the most powerful in arresting all kinds of fermentative and putrefactive changes."

Carbolic acid is now used by the New York Board of Health, as a cholera disinfectant; and the Medical Health Officers of this city (Toronto) strongly recommends this acid, and carbolate of lime—a powder prepared by Lyman & Elliot, similar to but stronger and cheaper than McDougald's Disinfecting Powder.

### Fleas and Musquitoes.

A correspondent of an American journal says that oil or essence of penny-royal is "a specific against the attack of fleas. I have always used it when fleas were in my bed or about my clothing, and found that it would banish them entirely, and am now using it with equal success to banish musquitoes; they will not come near where it is."

The amount of steam-power employed at all the ironworks in the kingdom has been estimated at that of 340,000 horses.

During the present year, the *Scotia*, an English iron ship, made the voyage from Queenstown to New York in 8 days and 17 hours; the fastest trip on record.