mystery about the fireman's duties in burning coke successfully, for any good coal fireman soon learns the few essential points, and after learning the method generally prefers the coke to coal. The best firemen carry medium-sized, level fires, and by constant attention and frequent light shaking of the grate bars, keep their steam pressure uniform, and prevent the objectionable carbonic oxide gas. Owing to the difficulty of keeping the fire up, however, most firemen prefer not to run the risk of letting their fires get away from them, so carry heavy fires, high near the door and sloping to about 12in. on the drop-gate. By wetting the coke the sharp, cutting dust is prevented from annoying the men on the engine.—*American Engineer.*

WATER AS A LUBRICANT.

Water is a good lubricant if it is rightly applied, says the New York Railroad Men. A knowledge of this fact and the wit to use it at the right moment helped an engineer out of a tight place. He had to take the suprintendent up the road on his engine for an important meeting. The superintendent was in a hurry, and they started out at a pretty lively pace. Everything went smoothly for a while, when the guides on the right hand side began to smoke. The engineer shut off, got down and found that guide in first-class shape as a frying pan, but its efficiency as a guide was seriously impaired. The superintendent got down too, and said "put some water on her quick." "No, sir," was the answer, "if you put water on that guide now you will twist it all out of shape." "What are you going to do?" said the superintendent, "we haven't much more than time to get there now." The engineer said nothing, but he took his wrench and eased off the nuts on the stuffing box studs, enough to allow the steam to blow through past the piston rod. He reasoned that the steam blowing on the hot guide and condensing would cool it just as effectually and much more gradually than eight or ten buckets of water dumped on at once, while the water would at the same time act as a lubricant. They got up and started ahead easy. The engineer watched that guide with some anxiety, for he was not sure of the result. At the end of ten miles he stopped, went down and felt it. With a calm smile and an "I told you so" expression, he pulled out the throttle, drove ahead, and brought the superintendent to his meeting in time.—*Railway Review.*

HOW AN AXE IS MADE.

The first step in the operation of making an axe, is the formation of the axe head without the blade. The glowing flat iron bars are withdrawn from the furnace and are taken to a powerful and somewhat complicated machine, which performs upon them four distinct operations—shaping the metal to form the upper and lower part of the axe, then the eye, and finally doubling the piece over so that the whole can be welded together. A workman stands by, seizing the partially fashioned pieces one after another with a pair of tongs, and hammering the lower edges together. Next the iron is put in a powerful natural gas furnace and heated to a white heat. Taken out, it goes under a tilt hammer and is welded together in a second. This done, one blow from the "drop" and the poll of the axe is completed and firmly welded.

When the axe leaves the drop, there is some superfluous metal still adhering to the edges and forming what is technically known as a "fin." To get rid of this fin, the axe is again heated in a furnace, and then taken in hand by a sawyer, who trims the ends and edges. The operator has a glass in front of him to protect his eyes from the sparks which fly off as the hot metal is pressed against the rapidly-revolving saw. The iron part of the axe is now complete.

The steel for the blade, after being heated, is cut by machinery and shaped with a die. It is then ready for welding. A groove is cut in the edge of the iron, the steel for the blade inserted, and the whole firmly welded by machine hammers. Next comes the operation of tempering. The steel portion of the axe is heated by being inserted in pots of molten lead, the blade only being immersed. It is then cooled by dipping in water, and goes to the hands of the inspector. An axe is subject to rigid tests before it is pronounced perfect. The steel must be of the required temper, the weight of all axes of the same sizes must be uniform, all must be ground alike, and in various other ways conform to an established standard. The inspector who tests the quality of the steel, does so by hammering the blade and striking the edge to ascertain whether it be too brittle or not. An axe that breaks during the test is thrown aside to be made over.

Before the material of an axe is in the proper shape, it has been heated five times, including the tempering process, and the axe, when completed, has passed through the hands of about forty workmen, each of whom has done something toward perfecting it. After passing inspection, the axes go to the grinding department, and from that to the polishers, who finish them upon emery wheels.—*Manufacturer and Builder.*

IMPROVED PASSENGER ELEVATOR ENGINE.

The accompanying engraving represents a view of an improved passenger elevator engine designed and constructed by the D. Frisbie Company, which is claimed by the manufacturers to possess certain features of merit for its intended service that are peculiar to itself. The reader will be able to form his own judgment upon these points from the following description of the engine and apparatus, which embraces the principal mechanical features:

The engine is of the four-cylinder reversible type, having a constant rotative motion of the crank at the most advantageous angle, and free from dead centers, since two of the cylinders are always at work, taking steam only at their outer ends. The speed attainable is claimed to be unlimited; but, whether running fast or slow, and with any load, from nothing to full capacity of the machine, the motion of the car is always smooth, comparing in this particular with that of the hydraulic elevator.