It is, perhaps, too obvious to require remark, that the scratches made by a file will be proportionate to the size of its teeth; and that the larger or coarser these are, the greater will be the effect which an adequate force will produce at one stroke. Hence the very evident propriety of commencing the work with the coarsest file intended to be used, and afterwards, in regular gradation, employing finer and finer ones, as it approaches to the finished state. Files may be obtained, the teeth of which are so extremely fine, that they will leave the surface of metal, especially if it be brass, almost as smooth as an oil-stone. These are, however, seldom necessary; and for most purposes, files of three or four different degrees of fineness, are quite sufficient.

[TO BE CONTINUED.]

On improvements in Evaporating fluids, Generating steam, Economising fuel, and Lessening the friction in machinery. By JACOB PERKINS, Esq., Engineer.

Mr. Perkins's improvement in evaporating fluids, and generating steam.—Knowing the superior conducting power of metals, for heat, over that of water, Mr. Perkins made the following experiment. He caused two circular blocks of cast iron to be made, with flat bottoms, and a hemispherical cavity in each of them, of about three inches in diameter; one of these cups or cavities he left plain, but he filled the other with conical projecting points of cast-iron, formed at the time of moulding it. Upon heating both vessels to the same degree, and putting water into them; he found, as he expected, that the water in the vessel filled with the metal points, evaporated much faster than that in the other vessel. He next caused some iron cylindrical tubes to be cast, having radiating ribs proceeding from the interior surface of each cylinder all round to the centre of it, where they terminated in thin edges. Two of these he connected with his tubular high-pressure steam generators, and placed them in that part of his furnace where the heat was the greatest. Here, owing to the rapidity with which the caloric is given off to the water, through the superior conducting property of the metal, the tubes never become red-hot, and are, consequently, not so liable to injury from the heat of the furnace, as his other tubes were, whilst they generate steam more rapidly.

Mr. Perkins's mode of economising fuel.—He purchases the refuse, or smaller parts of gas-coke, which he sifts, so as to separate the minuter parts from those of a larger size; the latter he employs as fuel in the usual manner, but the dust he mixes with one thirtieth part of clay and water, and strongly compresses the mass in a cylindrical tube, out of which it falls in cylindrical pieces, more or less long. These he dries upon the top of his furnace, and they are then as capable of being burnt in it as the ordinary gas-coke. By

this means, he has actually been enabled to work his high pressure steam-engine, alone, or without doing any work for twelve hours, at the trifling expense of eleven-pence-half-penny! And, no doubt, the same economy will be experienced, in a proportionate degree, whatever work the engine may perform.

Mr. Perkins's mode of lessening friction in machinery.—He has succeeded in avoiding the necessity of employing oil, grease, or any other lubricator to the piston of the steam engine, in the following manner. His piston is formed of a bell-metal, composed of the following materials:—

Copper	-	-	-	20 parts.
Tin	-	-	-	5 do.
Zinc	-	-	-	1 do.

This, as well as his cast-iron cylinder, is cast under the pressure of a considerable head of metal; by which means, the density and closeness of grain of each of them, is very greatly increased, and, indeed, the cast-iron has as close a grain as wrought iron itself! These two metals he finds to act so as to polish each other in use.

He also uses the same dense cast-iron to form his steam engine crank-axes, and the spindles or axes of his grind-stones, &c.; and he runs the cylindrical necks of them upon bearings formed of his bell metal, placed underneath them, and made with hollow cylindrical cavities, across their upper faces, not exceeding the sixth part of a circle in extent; and yet, upon these very small bearings, his necks run, with a very trifling portion indeed of grease, as a lubricator to them; whereas, as is well known, the bearings commonly in use, are semi-circular.

In this manner, the cylindrical necks of the axis of a large grind-stone, employed in grinding large articles, run; and yet, on throwing off the band from the rigger, or band wheel, the stone will make fifty revolutions, at the least, before it stops!

Mr. E. Turrell reminds us, that he was informed by Mr. P. Keir, that Mr. Kinman, formerly of Shoe-lane, London, used always to cast his brass ordnance, for the service of the East India Company, under a considerable head of metal: and this, together with the great care he took in watching the exact period when his metal in the furnace had attained its proper quality, as he ascertained by taking out specimens of it from time to time, caused his guns to possess a decided superiority over others, cast without using those necessary precautions.

[*Tech. Rep.*

On Annealing Electrum and Tutenague.

THESE compound metals require a particular management in annealing them; they ought to be heated red-hot in a fire, made either of fir or deal, without knots; or in one made with the wood of the lime-tree; and be suffered to cool slowly, covered with the ashes.

The *electrum* is a new white metal; now getting into use, as a sub-