ever, are then removed and carried to large oval tubs, which, with their attachments, are called rag engines. On one side of the partial partition, which coincides with the major axis of the oval, and makes a continuous channel, is a veritable paddle-box, within which revolves a system of knives. On the floor of the engine, and nearly touching the first knives, is an iron bed-plate, in which are fastened other knives. Water is all the time running into the engine on one side through a flannel filter, the surplus being removed by a cylindrical drainer of wire gauze on the other side. The motion of the knives keeps the mass of rags and water moving all the time by drawing the rags in at one side of the paddle-box, and throwing them out at the other. The bleaching of the rags is now effected by the addition of the necessary quantity of a solution of bleaching powder, which quantity is of course dependent on the quality of the rags. The chlorine is slowly liberated by the addition of sulphuric acid in a highly dilute condition; the whole process of bleaching in the engine occupying about twelve hours, at the end of which time the rags are reduced to "half-stuff." Any undesirable quantity of free chlorine is then neutralized by a solution of sodium thiosulphate or antichlor, as it is known to paper makers, and the half-stuff is transferred through a trap in the floor of the engine to the drainers, which are small rooms having a perforated bottom, and directly under the engine. There it remains for several days, the chlorine acting slowly on the stock and the water draining out.

Leaving the drainers we returned to the engine room, where the half-stuff was undergoing further transformations to fit it for the paper machine. The heating engines, in which the half-stuff is reduced until it shows the proper fibre and is free from lumps, are similar to the rag engines just described, except that they are without the drainer of wire gauze. They are generally filled to nearly their utmost capacity with water and the half-stuff, mixed for the cheaper papers with a large percentage of wood pulp, and after the whole has become thoroughly mixed the engine-size is added. This is merely a resin soap, made by boiling ordinary resin with a solution of soda ash. The further addition of alum after the heating action of the engine has continued for some time, precipitates the sylvates and pinnates of aluminum together with the aluminum salts of the other acids contained in the resin in and upon the fibres of the pulp, destroying their capillary action, and so rendering them when in the form of paper more or less impervious to moisture, while preventing to a large extent the spreading of the ink. The quantity of engine-size used varies greatly in the different mills, and with the sort of paper to be made. A large amount is objectionable, however, as it causes frothing when the pulp flows on to the paper machine. The coloring matter of the paper, if any is to be used, is also added to the material in the engine, and is generally some mineral substance, as ultramarine, chrome yellow, or red lead, although the aniline dyes are used to some extent. A small quantity of ultramarine is generally added, even to white paper, since a blue white is more agreeable than one containing a large proportion of yellow.

The proper condition of the pulp is determined by the foreman by shaking a small quantity up in a wash basin with a considerable amount of water, and then slowly pouring the whole into another basin. The fibre can thus be readily examined, while any lumps which may be present are easily seen. When the whole is ready for the machine the pulp is transferred to great circular vats, where it is churned constantly to keep it of uniform consistency. It is then pumped up as fast as needed into the machine room, where it undergoes the final transformations, which lack of space compels us to reserve for a second article.

A. D. L.

The Faculty have voted that when five or more students in a class have lectures following each other consecutively, they shall close five minutes before the hour, in order to give students sufficient time to pass from room to room or from building to building.