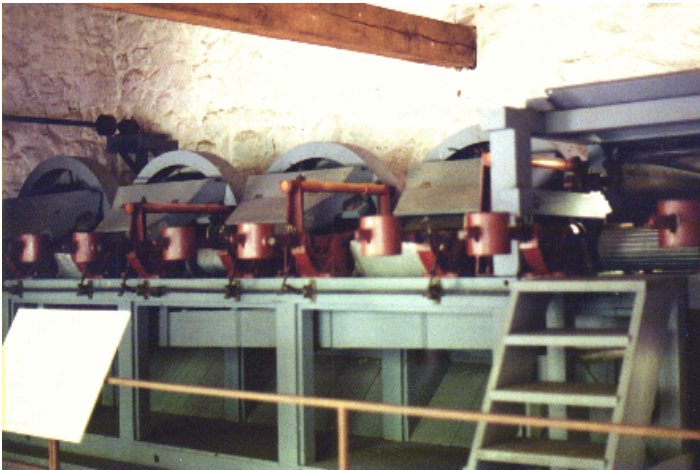


## Corning.

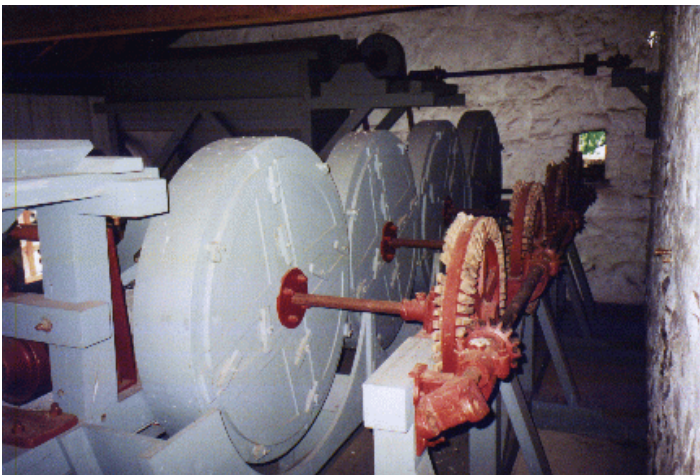
Black powder is a surface burning propellant. That is to say that the surfaces of the grains are ignited and then burn toward the center. Grain sizing is used as a means of controlling pressures within the gun.



**Figure 42.** Corning mill, front view.

This is a view of the front of a “5 roll” corning mill. This particular corning mill has 5 pairs of rolls that are used to break chipped press cake down into powder grains of varying size.

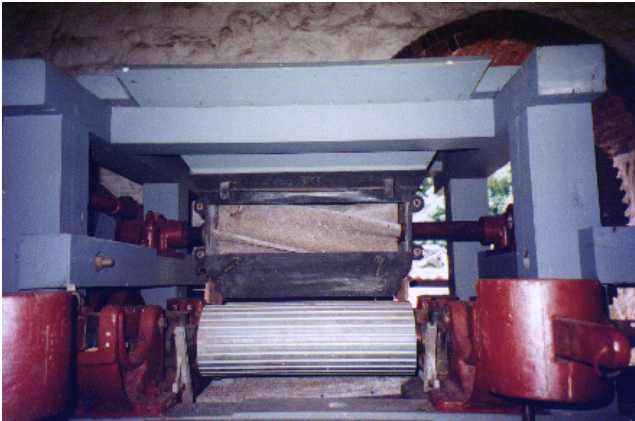
This corning mill has been reconstructed and is on display at the Hagley Museum And Library just North of Wilmington, DE.



**Figure 43.** Corning mill, rear view.

The corning mill was originally powered by a water wheel or water turbine. Note that the large ring gears that drive the powder elevators, within the circular housings, have wooden teeth attached to the cast iron rings. This is a safety measure as you would not want thin films of powder dust caught between meshing gear teeth where the powder could be ignited by pressure heating from the mating, moving gear teeth surfaces.

Chipped press cake is placed in a fee hopper that is suspended above the first pair of rolls in the corning mill. Beneath the feed hopper is a metering roll.



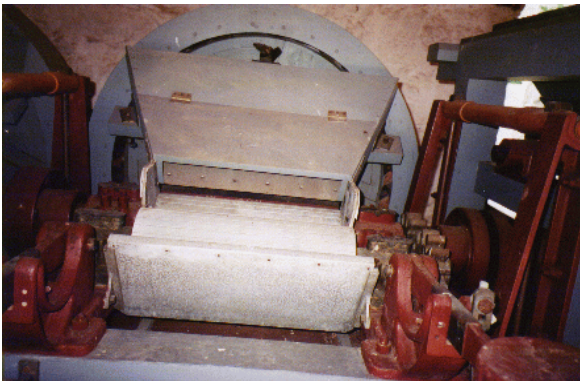
**Figure 44.** Metering roll and first set of rolls.

until the rolls are confronted with a piece of material that is too hard for them to break down. This is a safety measure that is not always 100% effective should any large pieces of metal enter the material being fed into the corning mill.

In the center of the photo is the fluted metering roll. From the metering roll, the pieces of chipped press cake fall onto a pair of break down rolls that are deeply grooved.

In the foreground of the photo are two counterweights on arms. The pair of rolls are set up with a gap between them. Should a piece of material fall between the rolls that is too hard for the rolls to break down they will separate. The counterweights maintain the pre-set gap

The pieces of chipped press cake are rather hard. They are best broken down in size through pressure from some sort of a sharp edge. The edges of the grooves in the rolls bite into the surface of the pieces and fracture them, rather than simply crushing the pieces. At this point in the corning process, simply pressure smashing the pieces would result in an excessive amount of unusable dust versus “good grain”.

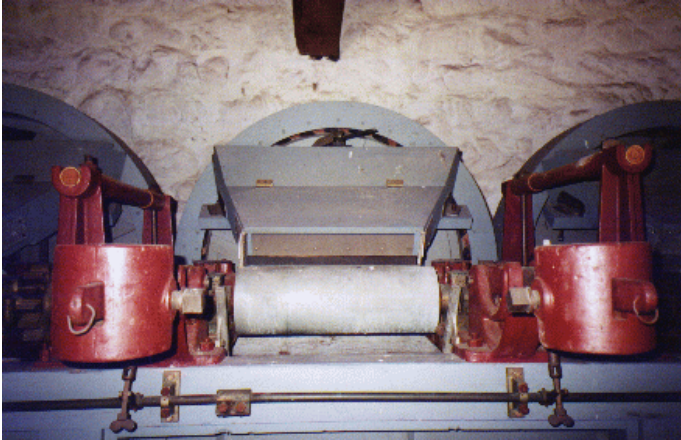


**Figure 45.** 2<sup>nd</sup> set of breakdown rolls.

The second pair of rolls, in the 5 sets, are also grooved rollers, but not as deeply grooved as in the first set. And again we see the counterweight mechanism used to hold the rolls in a pre-set gap position.

In the rear of the photo is one of the powder grain elevators seen in Figure 43.

Powder that had passed through the first set of corning rolls is picked up from a trough and dumped into the angled hopper mounted over this pair of rollers. The powder elevators consist of scoops mounted on a ring that pickup the powder from the trough and then dumps that powder into the hopper above that particular pair of rolls.



**Figure 46.** 3<sup>rd</sup> set of breakdown rolls.

The third pair of rolls have fine grooves in each roll.

The fourth and fifth pairs of rolls have smooth surfaces. Each pair, or set, of rolls are fed with powder via the circular elevator in the rear.



**Figure 47.** Sifter.

When the grained, or corned, powder leaves the corning mill it is lifted to the top of a screening unit. The elevator consists of a belt with leather buckets attached.

The corning mill product is screened and periodically dropped into the buckets. The contents of the different buckets being placed in other containers suitable for transport to the drying and glazing operation.

The horizontal corning mill seen in the reconstruction of the duPont works at Wilmington, DE appears to have been unique to duPont.

The vertical stacked rolls corning mill was developed in England by Sir William Congreve in the mid-19th century. This design, in its different modified forms, is now widely used in the industry.



**Figure 48.** Corning mill in the Swiss black powder plant using 3 pairs of rolls.



**Figure 49.** Feed conveyor.

A conveyor belt carries broken pieces of press cake to the top set of rolls in the corning mill.

The above photo shows a conveyor belt under the mill that carries the grained powder out from under the bottom set of rollers.

When this machine is in operator the operator is not in the same room with the machine. The conveyor belts are served from another room.