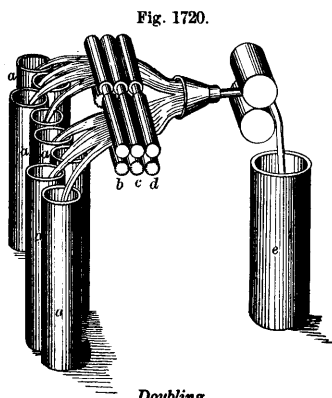


### Doubling.

3. (*Cotton or Wool.*) Bringing two or more *slivers* of fiber together and forming them into one of greater thickness, to be again reduced by drawing; thus obtaining a sliver of uniform thickness.



The slivers from the carding-machine, each in its separate can *a*, are conducted between one pair of rollers *b*, which causes them to coalesce; then through a second pair *c*, revolving at an increased speed, which draws out and lengthens the sliver, and then through a third pair *d*, which still attenuates the sliver. The operation is repeated as often as may be necessary to correct every inequality in the thickness of the sliver.

The next process is *roving*, which is also performed by *drawing-rollers*; but as the sliver has become so

reduced in thickness, it receives a slight twisting, to enable it to hold together. This was formerly obtained by giving a rapid revolution to the receiving-can *e*. See *ROVING*; *DRAWING*.

4. (*Flax-manufacture.*) The process with flax is similar to that described as pertaining to cotton.

In the first place, the *stricks* or handfuls of hackled flax are spread on a traveling-apron and conducted to drawing-rollers, which bring the filaments to an attenuated sliver and deliver it into cans. The slivers from a number of cans, from six to fifteen usually, are then conducted to drawing-rollers, being thereby *doubled* and *drawn*; the process is repeated, as with cotton, until the sliver is equalized and reduced to the required degree. See *DRAWING*.

5. (*Silk-manufacture.*) The twisting together of two or more filaments of twisted silk. This process follows the first spinning of the filaments of silk, and precedes the *throwing*, which is a farther combining of threads and twisting them together. First, the twisted filaments; then the *doubling*, forming *dumb-singles*; then the *throwing*, forming *thrown-singles*.

The process of doubling silk differs from that of doubling cotton and flax, inasmuch as the silk filaments are continuous and cannot be *drawn*. The *doubling* of flax or cotton fibers is for the purpose of equalizing the thickness of slivers, and the *drawing* which accompanies each operation is for the purpose of lengthening the combined slivers so as to make an attenuated sliver. By this means any trifling irregularity in the thickness of a sliver is lost by causing it to coalesce with others and elongating the bunch; the process being repeated again and again, as may be necessary.

In the doubling of silk, as there is no re-attenuation by drawing, the number of filaments are combined into one thread of the aggregate thickness of the several filaments.

The bobbins of thread to be doubled are mounted on a small frame, and the ends, being collected, are passed through a loop and attached to a bobbin, upon which they are wound. The parallel threads are then transferred to a horizontal reel, from whence each set of combined threads is carried through the eye of a rotating flyer and wound upon a bobbin, the combined threads or strands being twisted into a cord. The latter operation is known as *throwing*.

The direction of the twist is varied for different qualities and varieties of silk goods.

In ordinary spinning of the silk filaments the twist is to the right.

For *tram*; the spinning of the filaments is omitted; when *doubled*, the thread is twisted to the right.

For *organzine* the filament is twisted to the left, then *doubled* and twisted to the right.

The twisting of the thread is *set* or made permanent by exposure to steam.