and woollen waste took fire on a summer afternoon, and resulted in the destruction of several buildings. In this case the waste filled with oil, was packed closely in bins, or compressed into bags for convenience of stowing. Evidently compression, or weight, was an element in this case of spontaneous combustion.

A large establishment for the manufacture of machinery was burned by being fired from a heap of iron turnings thrown out from a convenient window, the greasy cotton cleaning waste being intermixed. It is hardly necessary, however, to have the element of greasy cotton waste in order to produce, or communicate, fire from a heap of iron turnings, chippings, and filings. The mass of disintegrated iron and its contained oil are enough to incite heat and combustion. And careful observers can see, in the dark, the blue luminous shivers of flames over a heap of iron drilling, chips, shavings and filings, adjacent to machine shops.

One of the finest blocks of buildings in an eastern city was destroyed, just before being ready for occupancy, by a fire started in an unused closet in which painters had thrown their overalls, these garments being presumably loaded with linseed oil and turpentine.

To these instances may be added some which were recently cited in *Chambers's Journal*. One of them dates back to 1780, when a Russian naval vessel took fire, and no cause except that of spontaneous combustion could be found or surmised. The fire was traced to a package of matting containing lampblack made from the smoke of fir and hemp oil varnish. A carefully observed experiment demonstrated the fact that a closely bound package of this mixture of lampblack and oil took fire within seventeen hours.

Wool-combings, packed in a warehouse in bins and trodden down hard by the workmen, set fire to the building. The wool was saturated with oil, or was at least oily, and the compression was probably one of the elements to spontaneous ignition

Oily hemp and flax in bales and heaps, took fire spontaneously in Plymouth dockyard and caused great destruction of property. In 1861 or 1862 there was a great fire in the Liverpool dock warehouses, caused, as far as could be ascertained, by the spontaneous ignition of wet cotton in bales.

The naval ships *Imogene* and *Talavera* were burned in Davenport dockyard by the spontaneous combustion of oakum and tow, that had been used as waste for wiping greasy tools and machinery, and thrown into a bin.

Experiments prove that cotton waste wet in boiled linseed oil, placed under a temperature of 170° F., took fire in one hour and a quarter. Raw linseed oil on cotton required four or five hours under similar preliminaries; olive oil, six hours; rape oil, ten hours; and castor oil, two days. As to animal oils, lard oil with the cotton produced ignition in four hours; seal oil in one hour and twenty minutes; and sperm oil—*probably adulterated with petroleum—did* not fire in two days. Is is generally conceded that the mineral oils, of whatever specific gravity or constituent characteristics, are not liable to aid in spontaneous combustion.

But there are other causes of spontaneous combustion not usually considered, and yet established as facts by experiments and observation. Grain, either in the kernel or the straw, if packed into the bins or piled into stacks while damp *or only partially cured, will sometimes* generate heat enough to cause combustion. Some of the supposed incendiary fires, by which barns have been burned, have been traced to this cause of spontaneous ignition, and in some other instances only that supposition was left as a reason for the fire. One case can be quoted as characteristic. It is taken from the *Annales d'-Hygiene:* A quantity of oats stored in a barn had been consumed by fire, and the proprietor suspected the act to be one of incendiarism. Several experts were consulted; and on enquiring into all the circumstances, they unanimously concluded that the fire was the result of spontaneous combustion caused by the fermentation of the grain stored in a damp state. Several things pointed unmistakably to this conclusion, such as the fact that the oats were proved to have been stored damp; that labourers had noticed the heat of the oats several days previous to the fire; that some of the sheaves that had been moved the day previous to the fire to be thrashed were charred and discolored; and above all, that the centre of a large pile of sheaves retained their natural color.—*Scientific American.*

## THE TREATMENT OF THE MAINSPRING.

The observant horologist will concur with me in saying that there is no one part of a watch not requiring as much care and attention as another. Yet watchmakers may be found by the dozen who regard certain parts of the movement as something inferior, something secondary in importance; and in first line, the mainspring may be classed in that category; they maltreat it until one thinks he has to do with a layman who plays with it for the sake of entertainment. The mainspring, at all odds, demands the same care in its arrangement and treatment as the balance spring, if it is intended to fully and completely discharge *its functions, and these are at* least tantamount to those of the balance spring. By an execution, no matter how careful, the watch will only render indifferent services, if its motor power, the mainspring, has been neglected. I do not claim these preceding remarks as new or my property, but facts compelled me to reiterate them before proceeding with the statement of my few observations and researches in the premises. The breaking of the spring also is the consequence of such bad treatment.

The causes which favor the breaking of the spring have been treated heretofore in this journal, (*Allg. Journ.*), and it is unnecessary to reproduce them. I suppose them to be universally known. Many will have experienced that soon after having cleaned a watch, the spring will suddenly snap, although having done services for ten years or more; else, a new spring is inserted, and a few hours afterward, or at the first winding, even, it breaks. Such accidents are often calculated to bring discredit upon the watchmaker, because according to the views of the layman, it is incomprehensible that a spring, after ten years' service, should break after cleaning, or that a new spring should snap.

In both cases the repairer is blamed for the accidents. In the first case, we must suppose that the barrel was correct in its shape, having harbored the spring for ten years; in the second, that possible defects causing the breaking of the first spring, were remedied. Under these suppositions, the cause may be looked for in the careless treatment the spring received. I have often had occasion to witness how the spring, for purposes of