tea and coffee pots, and similar articles, to prevent scratching of the table, tray, stand, or other things upon which they may be placed.

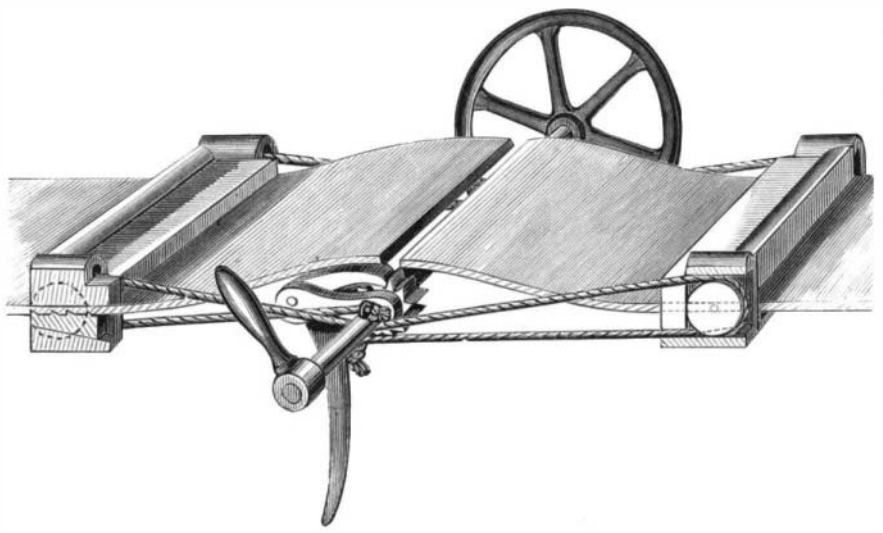
An improvement in grain-meters has been patented by Mr. Alexander Kaiser, of Munich, Bavaria, Germany. The object of this invention is to provide an improved apparatus for weighing and measuring cereals or other granulated or pulverized substances.

An attachment for ladders, patented by Messrs. Joseph D. Norton and Leonard M. Norton, of Loudville, Mass., consists in a central arm clamped on to the upper rounds to act as a pivot to permit the bottom of the ladder to stand square upon the ground when the ladder is placed against any oblique or irregular object, like the limb or crotch of a tree

IMPROVED BELT STRETCHER.

The engraving shows an improved belt stretcher recently patented by Mr. P. H. Kum, of Dixon, Ill. It consists of two clamps capable of grasping the belt tightly, and provided on opposite ends with pulleys, around which ropes pass, one rope being upon each edge of the belt. The ends of the ropes are attached to a windlass located between the clamps and operated by levers at opposite ends of the windlass, or by a lever and pawl acting on a ratchet wheel in the center of the windlass.

The clamps are made with a wedge-shaped serrated piece that clamps the belt in a wedge-shaped mortise, an increase in strain on the belt increasing the pressure of the clamp.



KUM'S BELT STRETCHER.

A Boss Miner.

A fire broke out in a shaft of a deep coal mine at Canton, Ill., and the miners made a wild rush for the elevator, crowding the cage and fighting for places. Five trips of the cage would carry them all up, but it looked as though the flames would quickly close the exit, and in the fright and confusion all struggled to be first. Tom Lukey, the cool and muscular boss of the gang, drove them all aside, and then called out the names of as many as could be hoisted out at once. In making the selections he chose those who had large dependent families. When the cage came down he filled it with those who had fewer relatives, and next time with husbands who had no children. It was not until the fourth lift that unmarried men were given a chance. The fifth carried some almost worthless bummers and Lukey himself, with the fire scorching their clothes. When praised for his act he carelessly replied: "Oh, that wasn't anything. If I hadn't got those fellows out of the way I would have been burned up, don't you see."

Canadian Industries.

A marked improvement in the industrial condition of our northern neighbor has taken place during the past year or two. The Minister of Finance, Sir S. L. Tilley, in presenting his annual budget the other day, said that at no period in the history of the country had government met parliament with the finances in as good a position, credit so high, and the people more prosperous, and he claimed that this state of affairs was greatly dependent on the protective policy of the government. The revenue year by year had been increasing until, from having a deficiency of $200,000 in 1879, the treasury had a surplus of over $400,000 for the twelve months ending last July. In 1879, government had proposed and parliament had agreed to remodel the tariff so as to protect native industries, and to-day, as a consequence, the factories were running full time and extending their premises and machinery; people were fully and remuneratively employed, money was plentiful, the ability of the people to buy was greatly increased, and, as a consequence, the volume of imports kept the revenue flourishing. He proved from statistics that the result of the tariff was largely to increase imports from Great Britain, and that the trade in breadstuffs between Canada and the United States had increased from 8,500,000 bushels in 1877–78 to 12,143,000 bushels in 1880–81, proving the groundlessness of the predictions of the opposition as to the results of the operation of the tariff.

Electric Lights in Philadelphia Post Office.

A Philadelphia paper says that there are seventy-five small incandescent lamps at present in use in the City Post Office, supplied by the Maxim Electric Light Company. Each lamp is run to twenty-four candle power, though the power can be more than doubled. When the lamps were first placed some trouble arose in the machinery, in breaking globes, and in the carbons burning out; but the two latter difficulties have been overcome. The carbons are supposed to burn from six hundred to seven hundred hours. Theoretically there is no reason why they should ever burn out, but experience demonstrates, in the Post Office at least, that the carbons rarely last over three hundred or four hundred hours of actual service. The base of the Maxim lamp is of vulcanite rubber and metal, and the work of removing the exhausted carbon and substituting a new one requires but a few minutes. Postmaster Huidekoper expresses himself very much pleased with the lamps. When they were first introduced some of the employes thought the light hurt their eyes and they wore shades, but, with two or three exceptions, these protectors have been discarded.

EFFECTS OF HEAT UPON STEEL.

The illustration shows the effect of heat upon steel. To produce these effects take a bar of steel of ordinary size, say about an inch by a half, and heat six or eight inches of one end to a low red heat, and nick the heated part all around the bar at intervals of half to three-quarters of an inch, until eight or nine notches are cut. This nicking is done at red heat, to determine the fracture at the nicks. Next place the end of the bar in a very hot fire and heat it white-hot until it scintillates at the extreme end, leaving the other parts enough out of the fire to heat them only by conduction. Let the end remain in the fire until the last piece nicked is not quite red red-hot, and the next to the last barely red hot.

Now, if the pieces be numbered from one to eight, commencing at the outer end, No. 1 will be white or scintillating hot, No. 2 will be white hot, No. 3 will be high yellow hot, No. 4 will be yellow or orange hot, No. 5 will be high red hot, No. 6 will be red hot, No. 7 will be low red hot, No. 8 will be black hot.

As soon as heated, let the bar be quenched in cold water and kept there until quite cold. After cooling, the bar should be carefully wiped dry, especially in the notches. An examination by the file will reveal the following, if high steel has been used:

No. 1 will scratch glass; Nos. 2, 3, and 4, excessively hard; Nos. 5 and 6 well hardened; No. 7 about hard enough for tap steel; No. 8 not hardened. In breaking off the pieces over the corner of the anvil they should be caught in a clean keg or box, to keep the fractures clean and bright.

No. 1 will be as brittle as glass; Nos. 2 will be nearly as brittle as glass; Nos. 3, 4, and 5 will break off easily, each a little stronger than the other; Nos. 6 and 7 will be very strong, and much stronger than No. 8, or the bar unhardened.

Place the pieces in the order of their numbers fitting the fractures, then upend each one, beginning with No. 1, and following with each in the order in which they lie, and the result will be fractures as shown so beautifully in our illustration, each differing from the other.

No. 1 will be coarse, yellowish cast, and very lustrous; No. 2 will be coarse and not quite so yellow as No. 1; No. 3 will be finer than 1 or 2, and coarser than No. 8, and will have fiery luster; No. 4, like No. 3, not quite so coarse, yet coarser than No. 8; No. 5 will be about the same size grain as No. 8, but will have fiery luster; No. 6 will be much finer than No. 8, will have no fiery luster, will be hard through and very strong. This is what is called REFINING by hardening. No. 7 will be refined and hard on the corners and edges, and rather coarser, and not quite so hard in the middle. This is about the right heat for hardening taps, milling tools, etc., the teeth of which will be amply hard, while there will be no danger of cracking the tool. No. 8 illustrates the original grain of the bar.

In nine cases out of ten the bar will crack along the middle to the refined piece. In the illustration the crack shows very plainly in No. 4, but we have never known this crack to extend into the refined piece, although we have repeated the experiment many times. We learn from this experiment the following:

FIRST, "*a*" Any difference in temperature sufficiently great to be seen by the color will cause a corresponding difference in the grain. "*b*" This variation in grain will produce internal strains and cracks.

SECOND, Any temperature so high as to open the grain so that the hardened piece will be coarser than the original bar will cause the hardened piece to be brittle, liable to crack, and to crumble on the edges in use.

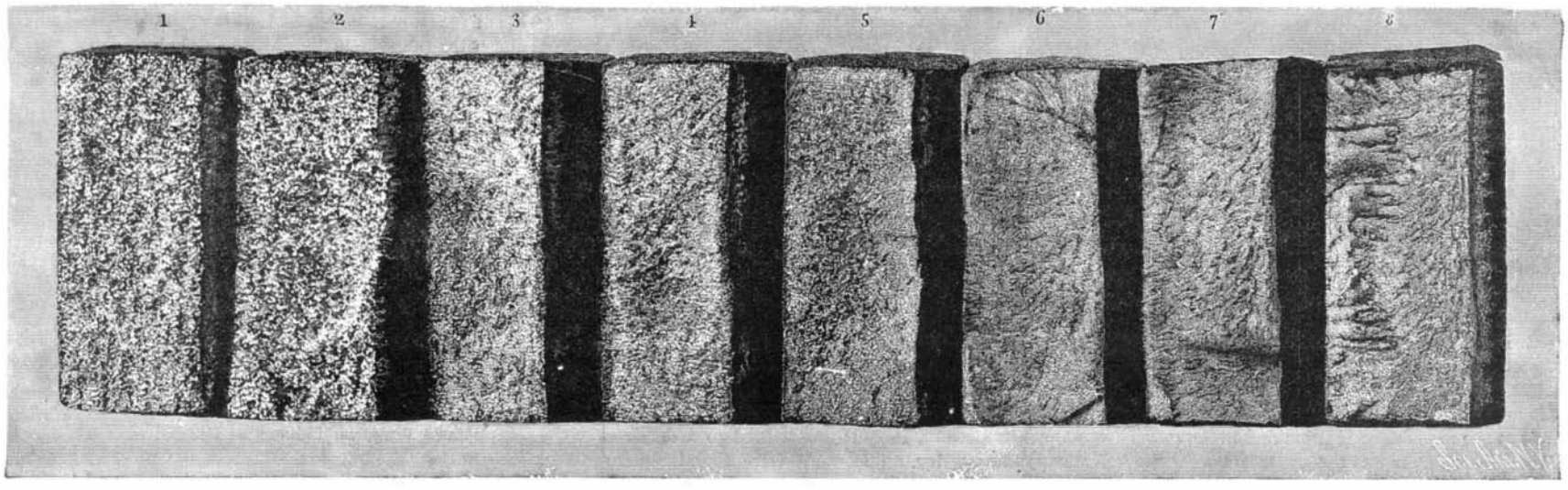
THIRD, A temperature high enough to cause a piece to harden through, but not high enough to open the grain, will cause the piece to REFINE, to be stronger than the untempered bar, and to carry a tough, keen cutting edge.

FOURTH, A temperature which will harden and refine the corners and edges of a bar, but which will not harden the bar through, is just the right heat at which to harden taps, rose-bits, and complicated cutters of any shape, as it will harden the teeth sufficiently without risk of cracking, and will leave the mass of the tool soft and tough, so that it can yield a little to pressure to prevent the teeth tearing out. These four rules are general, and apply equally well to any quality of steel or to any temper of steel.

Steel which is so mild that it will not harden in the ordinary acceptance of the term will show differences of grain corresponding to variations in temperature.

To restore any of the first seven pieces shown to the original structure, as shown in No. 8, it is only necessary to heat it through to a good red heat, not to a high red, allow it to stay at this temperature for ten minutes to thirty minutes, according to the size of the piece, and then to cool slowly. If upon the first trial the restoration should be found incomplete, and the piece upon being fractured should still show some fiery grains, a second heating continued a little longer than the first would cause a restoration of fracture. This property of restoration is not peculiar to any steel, and its performance requires no mysterious agencies beyond those given above.

It should be distinctly borne in mind that a piece restored from overheating is never *quite* as good as it would have remained if it had never been abused, and we strongly advise that no occasion should ever be given for the use of this



THE EFFECTS OF HEAT UPON STEEL.