upon a flat plate instead of a cylinder, as in the Edison and Bell devices.

Mr. Berliner, in his paper, reviewed the history of the telephone; the phonautograph, invented by Leon Scott and patented in France in 1857; the invention of Charles Cross, described in a sealed communication to the French Academy of Sciences, April 30, 1877, but which was not read until after Edison produced his phonograph. To Cross Mr. Berliner gives the credit of having first suggested the idea of a feasible plan for mechanically reproducing speech. He also referred to the graphophone, invented as an improvement on the phonograph, and the lately perfected phonograph of Edison, both of which use wax for receiving the impression instead of the tinfoil first used. In the gramophone a polished metal plate, generally zinc, is given a coating of etching ground, composed of beeswax digested in cold gasoline or benzine, which is extremely sensitive to the touch, but protects the plate from the influence of acids.

As the plate is revolved by clockwork, the stylus of the recording apparatus, which has a lateral instead of a vertical motion, as in the earlier inventions, cuts a waved line through the etching ground. The plate is etched with a solution of chromic acid, the groove being deepened by "rebiting," and placed in the reproducing machine. The latter is constructed on the same principles as the recorder, but of smaller dimensions and with more rigid mountings, the stylus being tipped with iridium to prevent its abrasion by continuous friction, and reproduces the sounds in much the same manner as the phonograph. In the demonstration Mr. William G. Fischer sang into the receiver parts of "Auld Lang Syne" and "When I Can Read My Title Clear," and Mr. Berliner recited into it a verse of "Mary Had a Little Lamb." When the plate was etched and placed in the reproducing machine, the sounds were reproduced with considerable fidelity to the originals.

MILITARY NOTES.

The recent assertion of General Wolseley that, if 100,000 hostile soldiers were landed on the British Isles, they could not be successfully opposed, because of the meagerness of the present military establishment, had the effect of waking up the old fogies of the war office, and setting Britain's legislators to thinking. The Premier made a very neat point on the General, who is said to be considerable of a martinet, by demanding to know how he could expect silent obedience from his subalterns, while himself publicly criticising his superiors. But he couldn't disprove the General's assertion that the country is wholly unprepared for war, save on paper, and so the breach in discipline and etiquette committed by the soldier was passed without further reproof, a large sum of money voted for the army, and steps taken toward reorganization on an effective basis.

General Wolseley seems to have thought that the urgency of the case warranted even so grave a breach of discipline, and the approving action of the commander in chief of the forces, the Duke of Cambridge, would imply that he did not overestimate the gravity of the situation. Though nominally only Adjutant-General, it should be remembered that Wolseley, in all likelihood, would be called to command should trouble come, for he has been called, perhaps not altogether facetiously, "England's only general;" and hence it is not at all strange that he should prefer to resign, indeed, he offered to do so, rather than shut his eyes any longer to what he regarded as fatal errors in the management of the army.

British troops have done great things in their day, and in the face of overpowering numbers, too, as when Wellington, with 25,000 men, some of them Spaniards and Portuguese and of no value, turned upon his 70,000 pursuers under Ney, at Busaco, in the Peninsular war, and beat them; and again when, in the Crimea, Col. Scarlet with a single brigade of cavalry, the "Heavy" brigade, charged successfully 10,000 Russian horse. These are but specimens of what the British soldier can do. History abounds with similar instances. But in those days, there is reason to believe, brawn and courage were of more value than now, when the direful machine gun and its cousin, the magazine rifle, have come into general use. The soldier whose nerves cannot stand the approach of cold steel has heart enough for the work behind the machine gun battery, and may prove a very demon with a repeating rifle on a half mile range.

And so it is that the British drum-beat, though heard around the world, is too widely distributed to make a deafening noise, and even in the British Isles it is scarcely more than a clatter when compared with the drum-beat of the Continental armies.

One of the results of General Wolseley's alarm was to give a large contract to our countryman Hiram Maxim, the inventor of an automatic machine gun that may fairly be called one of the wonders of this age, and which has been described and illustrated in the SCIENTIFIC AMERICAN. In it the recoil of the piece when once fired is utilized to throw out the empty shells, ram home fresh charges, and, at the same time, keep a column of cool water moving about the barrels to prevent heating. Left standing upon its tripod by a retreating army, it will keep up a rapid and murderous fire upon the advancing pursuers to the last second of effectiveness, and, if properly handled, may be made to scatter its deadly bullets along the ranks of an enemy, like a storm of iron hail blowing in his face.

Maxim first attracted attention in this country shortly after Edison had found a means of subdividing the electric light. As will be remembered, Edison used carbon filaments of bristol cardboard in his vacuum lamps. There being no such thing as a true vacuum in nature, the lamp when it left the mercury pump still contained enough oxygen to insure the gradual disintegration of the carbon loop. Maxim constructed a lamp on similar principles and filled it with the vapor of gasoline, which, when the carbon had been worn away by combustion, deposited a like amount of the same material on the threatened part, thus keeping the carbon loop in repair. But it stained the glass of the lamp also, and was little used, but was nevertheless an original idea, as was also the making of carbon loops out of carbon cut from gas retorts.

There is great alarm in Central Europe at the continual movement of Russian troops toward the Austrian frontier. *L'Avenir Militaire* quotes the journals of this district to the effect that the 19th (Stawropol) division of the Russian army, long stationed in the northern part of the Caucasus, is on its way to the Austro-Russian frontier. Russian diplomatsinsist that the continual movements of large bodies of troops toward the Austrian frontier is in accordance with the Czar's desire to strengthen the western limits of the empire, and have no other signification, but military Europe seems to be agreed that it means preparation for a war that is inevitable, and for which the Czar and his advisers are diligently seeking a pretext.

PHOTOGRAPHIC NOTES.

A Continuous Magnesium Powder Light.—On page 200 of the March 31, 1888, issue of the SCIENTIFIC AMERICAN is shown in Fig. 1 a method of blowing magnesium powder into a flame of alcohol by means of a pneumatic bulb. Dr. H. G. Piffard recently exhibited an improved method by which a continuous current of compressed air or oxygen gas, regulated by suitable stop cocks, forced the magnesium powder very evenly and rapidly out of its reservoir into the alcohol flame, producing an enormous magnesium flame of high actinic power. The oxygen intermingling with the magnesium particles aided its rapid combustion. The flame can be kept up as long as the powder is supplied. An ordinary cylinder of compressed oxygen, such as is furnished for the lime light, was employed.

The Cellulograph.—This beautiful new style of photograph was lately exhibited before the New York Society of Amateur Photographers, and is made by Mr. C. Theo. Cain, of Owensboro, Ky. A positive is made on glass with collodio-chloride emulsion, toned in the usual way, and then transferred on to a sheet of white celluloid. The process is quite simple. The resulting picture looks very similar to the well known ivorytypes. The sheet of celluloid can be easily embossed, shaped, and moulded into beautiful designs. It makes a very novel and durable picture.

Lantern Slide Mats.—A simple but quick way to construct dies to cut out lantern slide mats is to take a clock spring, file one edge down and bend it around a block of the desired shape of the mat, having the filed edge inward. Suitable holes are punched in the steel spring, through which screws pass, to fasten it to the block. The spring projects about one-fourth of an inch above the surface of the block, and when put in place presents a sharp cutting edge. The block should be made of hard wood. The paper is folded in four thicknesses, placed on the die, and is cut out by tapping on a hard wood block with a hammer, the block, of course, resting on the paper.

Purple Tones on Wet Plates.—To obtain purple tones it is customary to tone the plate before fixing with a solution of bichloride of palladium; but we have found a way of producing a brilliant purple tone during development.

The following is the formula for the developer:

Water	4 ounces.
Acetic acid	20 minims.
Pyrogallol	¾ grain.

The developer acts somewhat slower than iron and acetic acid, yet it proceeds gradually and rapidly. It is quite important to get, as near as possible, the right exposure.

After fixing in a hypo. bath one to six, the plate will have a beautiful purple tint, which is generally admired in transparencies and lantern slides.

Exhibition of Photographs.—A very large exhibition of photographs was held in Boston, Mass., between May 7 and 12, comprising the work of three amateur photographic clubs and others. It is said to have numbered nearly 1,000 pictures. Over 6,000 persons visited the exhibition.

Action of Water upon Wool Fibers.

Pure and, before all things, soft water, that is, water which contains as little foreign admixtures as possible, is just as indispensable for a good finishing as it is for washing and dyeing. It imparts to the wool a soft feel, and maintains its natural luster without increasing it noticeably or changing it into a shiny water luster. A continued treatment of teaseled cloth with hard water is just as injurious as one with soft water is advantageous. Any one wishing to make the trial can easily satisfy himself of the truth of this statement by teaseling two pieces of cloth, equal in all respects, the one with well water, the other with distilled water. Rain water also is very well suited for imparting to the wool fiber a soft feel and an agreeable luster. In the good old time, the majority of smaller manufacturers immersed finer grade napped cloth in a vat of carefully collected rain water for several days after teaseling or after the first steam-lustering, and considered this method as one imparting an especially delicate feel and nice, deep luster.

This luxury, if we may be permitted to so call it, cannot be indulged in by the large manufacturer of our day. Still, the small manufacturer may, whenever he produces a specially handsome line of cloth, go to this little extra manipulation—*provided* that sufficient quantities of soft water are at his disposal. Long rivers generally contain the best and softest water, which is doubtless due to the fact that the water is exposed to the ameliorating influence of air and sun for a longer time. The water of creeks and mountain streams is generally hard. Finishers living in a large cloth manufacturing district in Germany, through which a river flows, aver that its water in spring is not as good as at other seasons, because at this season it receives large quantities of water from the surrounding mountains and other immediate sources. Some even go so far as to assert that they are able to recognize the goods finished with water of the spring season.

It is obvious that the influence of water at a high degree of temperature must be much more intense upon the wool fiber, and naturally obstinate wool may, by treatment with hot or boiling water, be made more sensitive and pliable. If, after the nap-teaseling out of full water, the cloth is loosely rolled upon rollers, and immersed for five or six hours in water of from 170° to 190° F., it will assume a very nice feel, and a good, smooth face, with a dull luster. The cloth, being withdrawn from the bath after the specified time, must be unwrapped at once, taken into the washing machine warm, and rinsed with cold water for from one-half to three-quarters of an hour. By this treatment with hot water the wool fiber is to a certain degree lixiviated. It voids a peculiar slimy substance, after the removal of which, by rinsing, the fiber becomes more pliable. By omitting this rinsing and permitting the slimy substance to coagulate again upon the fiber, the principal effect is lost.

Here, also, this rule may be applied: The softer the water the greater the effect; and it has been found that the good appearance of the cloth is increased by the age of the water in the reservoir, that is, the oftener it has been used. It is natural that the foreign ingredients will separate from the water the oftener it is heated. At any rate, the reservoir must occasionally be emptied and cleaned, on account of the constantly forming sediment. Pieces of cloth which have been prepared for teaseling in the customary manner also become much softer in such a water, which, as aforesaid, had been used repeatedly. They teasel much more quickly, and take a softer and fuller nap than those treated with fresh water.

Our remarks referring to the operations in which the influence of water upon wool is to be considered, are also applicable to the treatment with steam in the steam lustering, steaming, and making ready for the needle. As is well known, steam is nothing more than water in a very finely divided form, and united with heat. Here, also, we find the ameliorating influence of the water upon the wool fiber accomplishing the desired effects, largely increased by heat.—*Industrial Record.*

The Flour Product of a Week.

According to the *Northwestern Miller* of May 11, the Minneapolis mills made 168,600 barrels of flour that week, and shipped 163,665 barrels, of which 47,800 barrels went abroad. The market is unsettled and dull, with prices higher. The St. Louis mills made 63,750 barrels that week. The market is fairly firm, but rather dull. The two largest mills at Winona, Minn., are temporarily idle, owing to high water in the Mississippi. The Indiana State convention was held at Indianapolis, with a large attendance, and decided to join the national association. The millers of the west-central Illinois district met at Springfield recently and formed a strong district organization. Thirty leading firm were enrolled and signed an agreement to work in harmony.