REPAIRING SPIRAL SPRINGS.

BY E. N. MAXWELL.

I find the impression is common among mechanics that it is not possible to mend a broken spiral spring. It might be well, therefore, to place the readers of the SCIENTIFIC AMERICAN in possession of my method, which is inexpensive, very simple, and thorough.

Take a piece of flat metal, of, say about one sixteenth inch in thickness, and cut it in the shape of a parallelogram, the length being one eighth inch greater than the diameter of the broken spring, the width equal to four of its coils; bore two holes on each side *exactly* the diameter of the spring apart, and sufficiently large to admit the spring wire; make, with a round file, a slight groove just opposite each hole, as shown in the smaller view in the engraving. Screw the broken ends of the spring into these holes from opposite sides, and the job will be complete, and at a trifling cost of material, time, and labor.

It will be seen at a glance that two springs of different diameters can be coupled together by the same process. Also, that a piece of similar metal with two holes upon one side and one hole on the other side will make a superior end piece for securing spiral springs.

The angles of the piece of metal used for mending, should equal those formed by the coils and side of the spring.

MENDING BROKEN SPIRAL SPRINGS

Copper-plating on Zinc.

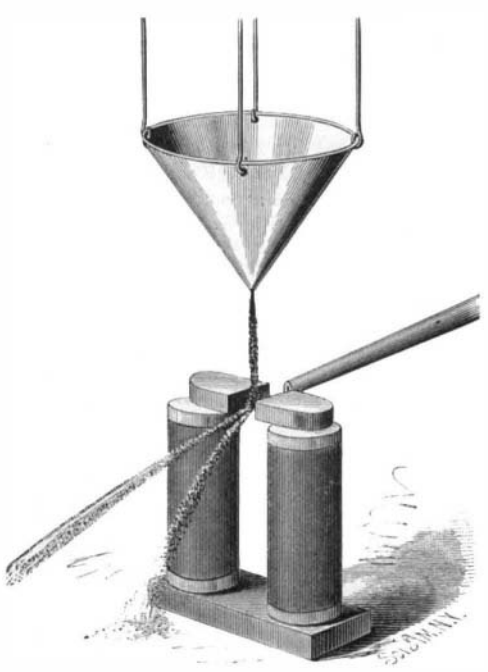
The use of cyanide baths for plating on zinc has the double disadvantage of being poisonous and expensive. Hess has overcome the objections by rendering the cyanide bath unnecessary. This he accomplishes by the use of an organic salt of copper, for instance a tartrate. Dissolve 126 grammes sulphate of copper (blue vitriol) in 2 liters water; also 227 grammes tartrate of potash and 286 grammes crystallized carbonate of soda in 2 liters of water. On mixing the two solutions a light bluish-green precipitate of tartrate of copper is formed. It is thrown on a linen filter, and afterwards dissolved in half a liter of caustic soda solution of 16° B., when it is ready for use.

The coating obtained from this solution is very pliable, smooth, and coherent, with a fine surface, and acquires any desired thickness if left long enough in the bath.

Other metals can also be employed for plating in the form of tartrates. Instead of tartrates, phosphates, oxalates, citrates, acetates, and borates of metals can be used, so that it seems possible to entirely dispense with the use of cyanide baths.

NEW ORE SEPARATOR.

In one of our recent issues we described a device invented by Mr. Edison for separating magnetic sands from the non-magnetic particles of ore by altering the trajectory of the



EDISON'S ORE SEPARATOR.

falling magnetic substance by means of an electro-magnet. We now give an engraving of another magnetic ore separator recently invented by Mr. Edison, which operates on an entirely different principle, and effects a still further concentration of the ore by the separation of the metallic from the non metallic part by diamagnetism.

The auriferous sands are placed in the hopper and allowed to fall between the poles of a powerful electro-magnet, and a blast of air is directed at right angles against the falling stream of sand just as the latter passes between the poles of the magnet. The non metallic substances are readily blown away, while the metallic portions are retarded by diamagnetism, so that the blast of air has less effect on them than it has on the non-metallic substances. The consequence of this operation is that the sands are divided into two heaps, one containing a large percentage of metal, the other containing a very small percentage, or none at all.

A Georgia Meteor.

About midnight, June 30, an exceptionally brilliant meteor was seen from Macon, Ga. The light is described as like an electric light, but whiter and vastly more powerful. The course of the meteor was from the zenith straight toward the horizon, which it would have reached at a point between north and northeast. At the zenith it appeared as large as a barrel and intensely white At 45° elevation the light changed to a brilliant red, paled into saffron, and then into all shades of green. As it began to change its hue it emitted particles or balls of fire that followed or lingered in its wake. Surrounding it, also, in this stage, was a dense vapor of smoke that reflected all the colors through which the ball had gone. At 30° elevation the light went out. Three minutes after a heavy report was heard, mixed with a metallic ring not heard in thunder or in ordinary explosions. The meteor was visible about five seconds. It is to be hoped that specimens of this body may yet be found.

The Largest Sheets of Plate Glass in the World.

The "*Société Anonyme des Manufactures de Glaces et Produits Chimiques de St. Gobain, Chauny, et Cirey,*" owns the works of St. Gobain, Chauny, Cirey, and Montlucon, in France, and Mannheim and Stolberg, in Germany. There are two other factories besides at Jeumont and Aniche.

The following plain white and silvered plates were exhibited by these firms, says Mr. C. Colné, in his report on glass, at the Paris Exhibition:

	Pounds.
St. Gobain; 1 plate 21·15 feet x 13·48 = 285·10 feet, white, 7-16 in...	1,573
St. Gobain; 1 plate 17·90 feet x 9·94 = 117·92 feet, silvered	770
Jeumont; 1 plate 17·81 feet x 11·51 = 205 feet, white.....	1,100
Jeumont; 1 plate 17·22 feet x 10·82 = 182·12 feet, silvered.....	770
Aniche; 1 plate 15·76 feet x 10·43 = 164·38 feet, white	660
Aniche; 1 plate 14·76 feet x 9·05 = 132·58 feet, silvered	55

The St. Gobain Works furnished a number of mirrors to the new Grand Opera of Paris; among others one 21·29 x 9·67 feet; others from 45·12 to 52·48 feet long.

St. Gobain also exhibited 3-16 inch thick plate glass for windows, weighing only 22 to 26 pounds per square meter; thick polished slabs, such as were used in the aquarium, 7·56 feet long by 2·60 feet wide, 9-16, 11-16, 14-16 inch thick; a series of silvered reflectors, deck lights, bull's eyes, plates of a rough cast glass, smooth on one side and corrugated on the other, used for roof covering, weighing about 27 pounds per square meter, from 1 to 2-8 inch thick. The designs on the surface consist of fine parallel corrugations or small and large corrugated and plain lozenges. The large lozenges are used as a substitute for painted or stained glass in churches for economical reasons. The small lozenges are used for partitions, doors, panels, windows, covered yards, hothouses, roofs, etc.

They also make glass tiles, pressed in imitation of the clay article. These tiles are used for roofing, and are moulded in such a shape that they can be laid alongside of one another, making tight-fitting joints without any cement or mortar; it takes 13 tiles to cover a square meter; each tile weighs about 5½ pounds.

Glass flooring made of flags or slabs of rough cast glass are also manufactured in large quantity by these works; they consist of pieces 6 x 1⅜ inches thick, 11 inches long, and weigh 165 pounds per square meter; the upper surface is generally moulded in diamonds. Pavements of glass are also exhibited; these are made in the same style as the slabs, with the upper surface moulded in diamonds, but are much thicker, and are intended for pavements for carriage ways. They are made of cubes of about 6 x 6½ inches, and weigh each 19·80 pounds; they are sold by weight. Rough slabs are also made of 6·56 x 2·65 feet, varying in thickness from 9-16 inch to 1½ inches; weight from 213 to 492 pounds.

This company also exhibits all the different rough cast glasses used in the manufacture of lighthouse apparatus, such as rings, parts of rings, and rough lenses. As a specimen of the thickness that can be given to cast glass, there was shown a disk 4·03 feet in diameter by 8½ inches thick, weighing more than 1,320 pounds. This disk is an exact duplicate of the one offered to the French Observatory to make a mirror for their large telescope.

Testing Alcoholic Liquors.

The following hints in regard to alcoholic liquors are given by Dubrunfaut in a French journal: Commercial alcohol and alcoholic drinks differ from each other partially by a characteristic flavor, partially by different chemical properties. A characteristic distinction is the amount of acid in the different liquors. All pure alcohols contain only 1 per cent of acid, while freshly distilled cognac shows 3 per cent, and this increases considerably when kept long in barrels. In ten or twelve years the same cognac will have 8 or 9 per cent of acid, while the original percentage of alcohol is reduced from 64½ to 50 per cent. The quantity of alcohol is decreased both by evaporation and the formation of acid. All other alcoholic liquors show the same changes, and in addition also contain copper. The presence of this metal is easily proved by ferrocyanide of potassium or sulphydric acid. If there is only a trace of copper the dry residue is burned and the ash tested. As a rule, industrial alcohol also contains copper. The percentage of acid varies enough to furnish a test for the addition of commercial alcohol to rum, brandy, etc., as an adulteration, or to strengthen it. The copper, however, furnishes no reliable clew.

A Steamer Runs Down a Lock Gate.

An unexpected source of danger in canal navigation has been demonstrated at Montreal. On June 30 the steamer Bohemian, carrying fifty passengers and an assorted cargo, entered canal lock No. 2 from the Lachine Canal Basin at half speed. For some cause, as yet unexplained, a full head of steam was put on and the steamer was hurled against the gate which separated the lock from a mass of water thirteen feet higher, a mile in length, and several hundred feet in width. The gates were smashed, and the flood which poured out carried everything before it. The Bohemian was driven back and sank almost instantly. The water drove furiously on, submerging wharfs, sinking many small vessels, ingulfing numbers of laborers, and carrying terror and ruin in every direction. It is said that the deluge of water set the huge ocean steamships in the harbor of Montreal dancing like so many cockle shells.

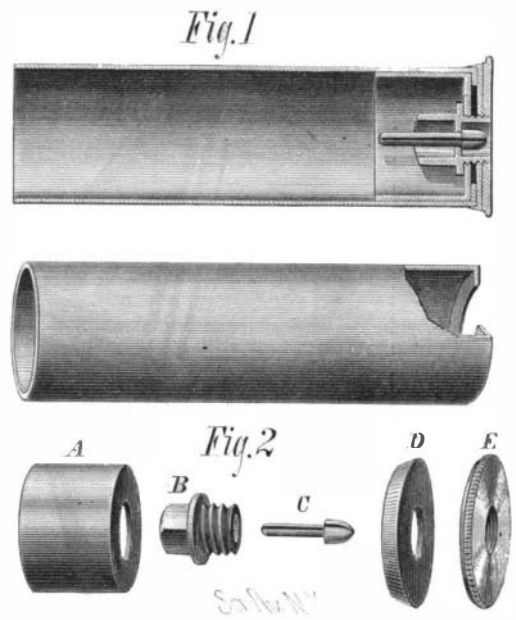
The outrush of water from basin No. 2 left the vessels in it on the bottom, many of them with broken backs. Others were severely strained aud their cargoes much damaged. Several weeks will be required to repair the mischief; meantime navigation will be impeded and several important mills stopped.

Progress in Rifle Shooting.

The victory of the American rifle team at Dollymount, June 27, with a score of 1,292 against 1,280 for their Irish competitors, six shooting on each side, shows that the limit of progress in rifle making and in rifle shooting has not yet been reached. This may be safely inferred from the fact that the best previous shooting in any match has been exceeded in this, and yet there is a considerable margin between its record and absolute perfection. The precision already arrived at, however, is such that but one of the 540 shots fired at Dollymount would have missed a man, the ranges being 800, 900, and 1,000 yards.

IMPROVED CARTRIDGE.

Cartridges as commonly made consist of four pieces—the tube, the head rimmed disk, an inner disk fitting in the tube, and a screw connecting the disks together and clamping the tube. This construction necessitates the use of a re-enforcing strip at the base of the shell, and the head disks lack strength. Our engraving represents a new method of constructing cartridge shells or cases, recently patented by Mr. Julien Saget, of New Orleans, La.



SAGET'S CARTRIDGE.

The tube, which is of paper, has one end flanged internally to receive the thimble or cup, A, which is threaded to receive the hollow screw or anvil holder, B. A flanged plate, D, is fitted over the end of the cartridge, and the plate, D, and thimble, A, are drawn tightly together by the anvil holder, B. The shank of the anvil, C, is now inserted in the holder, B, and a circular steel plate, E, is screwed on the anvil holder, completing the cartridge shell, as shown in Fig. 1. The shell is charged in the usual way, and a cap is placed on the anvil, C, and pressed home.

Should the paper tubes be injured by the explosion or otherwise, it is readily replaced by a new one, thus saving the more expensive parts of the cartridge.

The steel plate added to the portion of the cartridge which receives the blow of the hammer, renders the cartridge more durable than those of ordinary construction.

Further particulars may be obtained by addressing the inventor as above.