The current is taken from the commutator cylinder by twelve brushes, six on either side, either one of which may be removed without disturbing the others. These brushes are supported by an arm capable of being rotated on an axis coincident with the axis of the armature, so that they may be made to approach or recede from the neutral point, and in this manner control the current.

This machine will furnish a current to eight hundred incandescent lamps. According to the most recent estimates as to economy, as obtained by indicating his present engine with 500 lamps, three and a half pounds of coal burned under the boiler per hour will generate a nett current sufficient for 8¾ incandescent lamps of 16 candles each, or 16 lights of 8 candles each.

IMPROVEMENTS IN THE SILVERING OF MIRRORS.

Astronomers, and all who are interested in the production of mirror surfaces for optical purposes by the deposition of silver upon glass, will learn with pleasure that this subject has been receiving practical attention at the hands of a painstaking experimentalist, Professor Piazzi Smyth, the Astronomer Royal for Scotland. Convinced of the great value of reflecting over achromatic telescopes for certain phases of astronomical research, Professor Smyth has lately been directing his attention to the eliminating from the film of deposited silver certain objectionable features which marred its usefulness when applied to the reflector or glass mirror of large reflecting telescopes.

Subject to slight improvements to be afterward mentioned, the quickest, best, and most reliable method of depositing silver on glass, and that by which large glass specula as well as flat reflectors for a heliostat have been prepared by this astronomer, is the following:

Solution A.—175 grains nitrate of silver dissolved in 10 ounces of distilled water.

Solution B.—262 grains of nitrate of ammonia dissolved in 10 ounces distilled water.

Solution C.—1 ounce of caustic potash, purified by alcohol, in 10 ounces distilled water.

Solution D.—Half an ounce of sugar candy and 32 grains tartaric dissolved and boiled for ten minutes or so in 5 ounces distilled water. When cold add 1 ounce of alcohol, and make up to 10 ounces with water.

To Mix.—Put one-quarter of A into a glass beaker, add one-quarter of B, and then, gradually, one-quarter of C. Stop if it gets cloudy and add a drop or two of B, and continue with one-quarter of C until it is all got in. Then add a drop or two of A till the mixture has a slight brown color that will not dissolve in a couple of minutes; let it settle, or filter through cotton wool. To this add one-quarter of D, when the glass is ready to put on.

The quantity of the whole should be such that when the glass is placed on the fluid there should be about a depth of three-quarters of an inch below it. If everything is right, the mixture will turn first a pale sherry color, and then an inky black. In ten minutes in hot weather, or twenty minutes in winter, deposition will be completed, after which the mirror is then removed, washed, dried, and polished with a rouged pad.

From an observation of the fact that the silver formed much more readily on glass lying on the top of the solution than that which lay in the bottom of the vessel, a little going downward, but by far the greater portion ascending, Prof. Smyth reasoned that the so-called silver could not be pure silver after all, but must be combined with some substance that has altered its specific gravity. To that substance, which he concludes is potash in some form, he attributes the further fact that a damp warm thaw coming on after cold will sometimes cause the polished film to leave the glass and rise up in blisters. By what means, therefore, was this hygroscopic element to be eliminated? All difficulties are overcome by lifting the mirror from the silvering bath, and after allowing some of the solution to drip off, transferring it to a bath of alcohol, into which it is allowed to remain, with gentle agitation, till no more coloring matter is given off. A great advantage is also found in the substitution of soda for the potash in solution C, using much less of it. The effect of the alcoholic bath is noteworthy and valuable. A more perfect adhesion to the glass, with consequent freedom from the blisters mentioned, added to the greater smoothness and amenability to the action of the rouge polishing pad, are among these advantages.

An effective way of cleaning the surface of the glass previous to its being silvered consists in rubbing it with nitric acid, which must then be wiped off with a cloth, followed by an application of powdered Spanish whiting, to which is added enough distilled water to make a paste. This is rubbed over the surface and allowed to become quite dry, when, by rubbing with cotton wool, it is all removed. On being seen to be dry and clean the plate is gently lowered, face downward, into the solution, taking care not to sink it so low as to allow the back to get wetted. The film, thus obtained possesses great body, solidity, and luster after being rubbed with the rouge pad, these qualities being very apparent when compared with a film obtained by the older processes.

THREE car loads of silkworms' eggs, consigned to George Carhart, and valued at $1,000,000, arrived in this city at 6 o'clock on Wednesday morning, January 5, by the Erie Railway, and were immediately put on board the French line steamer for France. They came from China, reaching San Francisco on the 28th ult.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included $3 20
One copy, six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars.* Both papers to one address or different addresses as desired.

The safest way to remit is by draft postal order, or registered letter.

Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, JANUARY 22, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 264.

For the Week ending January 22, 1881.

Price 10 cents. For sale by all newsdealers.

PHARAOH'S SERPENTS—ARE THEY DANGEROUS TOYS?

Serpents' eggs, or, as they were at first called, "Pharaoh's serpents," are much more easily produced than their extraordinary properties and the high-toned sound of the name, mercurous sulphocyanide or sulphocyanide of mercury, would indicate. For this mercurous sulphocyanide is a very fine, white, soft-feeling powder, and when wet up with weak gum water may be kneaded or moulded into any desired form. In early days the standard form was a cone about one-third of an inch high, and the conical masses, after drying, were covered with tin foil. Of late the pill form is the fashion.

But the mercurous sulphocyanide is not a commercial article, and perhaps there are not in all the world half a dozen stores where it is kept in stock; probably its only industrial application is to be found in the serpent manufacture. Moreover the raw materials, which, by a direct and simple process of mixture, result in the production of the mercurous sulphocyanide, are not commercial; these materials are sulphocyanide of potassium and nitrate of mercury. When solutions of these salts are mixed, the mercury and potassium change places, and immediately there result mercurous sulphocyanide, the serpent constituent, which precipitates, and nitrate of potash (saltpeter), which remains in solution. The foregoing is all the instruction which a chemist should require to understand and execute successfully the serpent making process; he should know what materials to start with and how to manage them. For tyros and others who may be concerned to know it, we give the complete process from the beginning:

Mix intimately two parts of yellow prussiate of potash with one part of sulphur; carefully melt this mixture in an iron or porcelain vessel at a gentle heat, far below redness, stirring all the time with an iron rod. The melting is successfully completed when the mass has become a tranquil liquid and will not throw up any more gas bubbles. On cooling you will have a black, brittle mass, from which water dissolves the sulphocyanide of potassium. Next dissolve mercury in diluted nitric acid, taking care that at the end of the process there shall still be undissolved mercury; you have then a solution of protonitrate of mercury. Dilute filtered solutions of the nitrate of mercury and of the sulphocyanide of potassium are to be prepared and to be mixed by pouring the former into the latter as long as a precipitate is produced. This precipitate is the mercurous sulphocyanide (the serpent substance), which is to be collected, washed, dried, etc.

When these marvelous serpent toys were invented, about twenty years ago, they were admired and talked about all over the world; there was a popular enthusiasm over them comparable in earnestness to that which sixty years ago greeted Sir David Brewster's kaleidoscope. But to-day it is the temper of the people to scotch Pharaoh's serpents, while Sir David's toy is as popular as ever. The fact is, the kaleidoscope is one of the joys forever, and the serpents belong to the breed of the venomous. The venom of Pharaoh's serpents is mercury.

Pharaoh's serpents at first were made and sold on a great scale, and it was not long before their vicious traits were manifested all over the country. At one of the serpent factories in this city, where the work was performed mostly by girls, it was found that about one in ten would be prostrated on the first day at the factory, and that a majority of the employes would be visibly injured within the first week of their stay by mercurial poisoning. Among the curious cases which turned up was that of an employe who continued in the business from first to last in the most robust health; he seemed to thrive on the mercurous sulphocynide which he was continually, one way and another, taking in, and thus to elucidate the old adage of meat and poison. We have known a person who could not with impunity touch mercury or remain in a room where a small surface of mercury was exposed to the air. When the eggs are ignited one of the products of the combustion is mercury in vapor.

We are constrained, therefore, emphatically although regretfully, to condemn Pharaoh's serpents as dangerous toys. Perhaps they may be permitted among the brilliant experiments of the chemical lecture, but for children to play with—not at all.

These remarks are suggested on reading a letter from an esteemed correspondent who thinks that the serpents may not be dangerous. He says he has made hundreds of them and has suffered no evil. If all the dangerous things were fatal, there would be no survivors to sound the warning.

ICE ROADS AND RAILWAYS ON ICE.

As soon as the St. Lawrence River is firmly frozen about Montreal the work of constructing winter ice roads is begun to connect the city with the mainland. As described in the local papers the method of making the roads is simple, and in frosty weather the work is easy. The track is first marked out by lines of small bushes; then the rough surface of the packice is hewn smooth and the fragments cemented by pouring on water. There are two roads to Longueuil, one rounding the corner of Ile Ronde and the other passing the eastern end of St. Helen's Island. The city pays half the cost of maintaining the lower road, while it constructs and maintains one-half of the upper road. The Laprairie road, which passes beneath the piers of Victoria Bridge, is located and constructed by the Laprairie authorities, the city of Montreal paying one-half the cost. The St. Lambert road is constructed and maintained jointly by the