for information which any school geography or the nearest public library could furnish. He then goes on to describe conditions of Brazilian climate, productions, social customs, and the like, which make it impossible for many articles of American manufacture ever to find a market there, pointing out at the same time several lines of manufactures which, by proper management, might be sold largely in that part of the world.

A particularly suggestive and valuable part of the report will be found in the comparison made between the methods of German commercial agents and merchants and those of our own country. The mercantile training of the former embraces not only all the details of office work, but a thorough knowledge of geography and of the products of every land, of mercantile law, and of at least two languages besides their own. The first business of the German agent is to master the language of the people he is to trade with, if he has not already acquired it. Similar qualifications are the exception among the ambassadors of American trade. The majority of them have to employ an interpreter to make their business known, and the interpreter can rarely speak so as to compel attention and belief. Under such unfavorable conditions it is not surprising that American agents in Brazil are apt to be less successful than those of German houses. On the other hand, manufacturers of goods suited to the Brazilian market, who have intrusted their business to competent agents, have been very successful.

Speaking generally, Mr. Adamson says that if the present business of an American manufacturer will warrant his spending a thousand dollars to study the Brazilian market, he should personally visit Rio Janeiro to see for himself whether his wares are adapted to the wants of the people, or whether they can be altered to suit that market. If these questions find an affirmative answer he should establish a live man from home as his agent in Rio Janeiro, with capital to tide over the first few months. In the case of American stoves it took years to get them introduced and teach the people how to use them; but with industry and perseverance the field was won, and a large demand for the article is certain. In like manner our sewing machines have made for themselves a splendid market in Brazil.

In this connection Mr. Adamson's statistical report of the trade of Brazil with different countries, the lines of steamships plying between Brazilian and foreign ports, and so on, will be found especially valuable.

## NEW METHOD OF PRODUCING PHOTOGRAPHIC PICTURES IN COLORS.

At a recent meeting, in Paris, of the Photographic Society of France, M. Bonnaud exhibited specimens of his new system of colorization, which attracted much attention. The process is as follows: A negative is taken in the usual manner, from which as many prints on paper are made as there are to be colors in the finished picture. If, for instance, it is a portrait of a lady, to be furnished in four colors—blue, orange, red, and green—four paper prints are made. From one of the prints all the parts that are to have the same tint are carefully cut out; for example, the lady's dress and the sky, which are to be blue, are cut out; from the next print the trees and grass are cut out, as these are to be tinted green, and so on. The cut prints being arranged to "register" are now to be used as stencils, and are successively laid upon a sheet of paper and colors thereto applied, through the stencils, by means of a brush—an operation which requires little skill and may be done by girls. The paper with the stenciled figure upon it, in the different colors, is now albumenized and then sensitized in the usual manner in the photo bath; after which the original negative is applied and a photo print made upon the sensitized colored sheet, then developed and toned as usual. Photographs thus made are said to be attractive, the gradations of light and shade in the colors being excellent, and the effects very pleasing.

The process is simple, costs but little, and the pictures, it is said, may be rapidly produced. Where large numbers of the same colored picture are ordered stencil plates are made in sheet brass, the parts taken from the paper print being used as patterns to cut the brass.

## THE TAY BRIDGE DISASTER.

The most appalling of railway disasters occurred on the evening of Dec. 28, at the bridge over the Frith of Tay, on the railroad between Edinburgh and Dundee, Scotland. At this point an iron bridge two miles long crosses the Frith on 85 spans, ranging from 18 to 88 feet above the water. Of these spans, six were 27 feet, fourteen of 67 feet 6 inches, fourteen of 70 feet 6 inches, two of 88 feet, one of 162 feet, one of 170 feet, and thirteen of 245 feet. The long spans near the center of the bridge were the highest above the water.

On the evening of the disaster a train from Edinburgh to Dundee, comprising locomotive and tender, four cars of the third class, one of the second, and one of the first class, and a brakeman's van, entered upon the bridge near seven o'clock, a high wind blowing at the time.

In the bright moonlight the train was seen to reach the middle of the bridge over the navigable part of the Frith, then, suddenly, with a flash of fire it disappeared. Subsequent examination found that a section of the bridge half a mile in length, comprising a dozen or more of the longer and highest spans, had fallen, and the train had been precipitated into the gulf. The railway officials report that the falling girders made a very clean break from that portion which remains standing. Almost the only signs of the catastrophe are in the ends of the rails where they were torn asunder. The rails remaining appear wrenched out of their chairs for a few yards.

For some hours the furious gale prevented boats from reaching the scene of the disaster. By that time no vestige of the wrecked train could be found; and for a long time divers were unable to discover any traces of it in the quicksands of the bed of the Frith.

The first report of the managers of the railway said that there were nearly three hundred passengers on the train besides the train-men. Not one survived. Later the authorities estimated the loss as low as seventy-five. The exact number will probably never be known.

It is impossible at this writing to obtain any clew to the cause of the disaster. The gale is said to have been the severest experienced in Scotland since 1868. It is most probable that the bridge was blown down. That its fall was occasioned by a derailment of the train by the wind, does not seem likely in view of great length of bridge destroyed. That the foundations of the piers were not undermined seems probable from the circumstance that one report speaks of the piers as still visible. Whatever the cause, the disaster remains the most remarkable and terrible in the annals of railroading.

A detailed account of the construction of the fatal bridge, with illustrations, was printed in the SCIENTIFIC AMERICAN SUPPLEMENT of April 7, 1877, and an account of the completed structure and its inauguration in the SUPPLEMENT for July 20, 1878.

## OUR VENOMOUS SNAKES.

The danger from venomous snakes in the United States, though small as compared with that in warmer countries, is none the less real; and the destruction of such snakes should always be encouraged. But unfortunately the popular notion of snakes, instead of making venomous species the exceptions, makes them the rule. This erroneous notion, coupled with a natural and perfectly proper feeling that no opportunity of destroying a dangerous reptile should be neglected, deals havoc alike to the harmful, the neutral, and the useful of serpent-kind.

Of course such a wholesale war entails the destruction of many serpents that are not only harmless but useful. And in this connection it may be worthy of notice that non-venomous snakes, which commonly attain a length of but twenty inches or less, subsist chiefly upon insects, worms, etc., and should be regarded as friendly to the interests of agriculture.

A generally available means of determining at sight whether a snake is venomous or harmless is therefore desirable.

As a general rule, the venomous snakes have thick bodies and broad, triangular heads, which they flatten when they wish to assume a threatening aspect; while the innocuous snakes have slender bodies and narrow heads, which they do not flatten. This rule is often laid down as a sufficient guide in this matter; but it is far from reliable. We have venomous species of colubrine form and of mild disposition, as well as innocuous species with the viperine form and habits.

Nor is there known any infallible external criterion of the nature of a snake. Even the herpetologist, upon discovering a new and apparently harmless species, cannot with certainty pronounce it to be harmless from its external appearance alone.

In order, therefore, to improve every opportunity of destroying those which are venomous, and at the same time to encourage those which are innocent, an acquaintance with some of the more obvious specific characters of certain serpents is indispensable. But if we inquire into the matter, we shall see that the number requiring such an acquaintance is very small.

In North America, including Lower California and Sonora, in Mexico, there are one hundred and thirty-two species of snakes. Of these twenty-two, or exactly one sixth, are venomous. (The ratio of one to five, however, should by no means be taken as the numerical ratio of the venomous snakes to the harmless, since the former are far less numerous individually than specifically.)

It is plain that an acquaintance with the twenty-two venomous species renders a knowledge of the one hundred and ten harmless species unnecessary. But sixteen of the twenty-two are rattlesnakes—belonging to three different genera, it is true, but for our present purpose merely rattlesnakes, since all possess rattles. The nature of the rattle is so well known in districts where these snakes occur that no description of it is here called for; and as this organ is so conspicuous, rendering the rattlesnakes easily distinguishable, these may be stricken from the number of venomous serpents whose recognition requires their specific acquaintance.

Of the six remaining species, two offer well marked varieties, a knowledge of whose appearance is important. We thus have but eight "kinds" of serpents requiring for their immediate recognition as venomous a knowledge of their form and markings.

But except for those whose pursuits lead them over widely separated localities, it will be unnecessary to know the appearance of even this small number. From one to three of them only will be found in most parts of the United States. In the region west of the Sierra Nevada not one of them occurs, the venomous serpents being represented by rattlesnakes alone. In the Northern States there is but one, the copperhead. In the mountainous districts of North Carolina and Tennessee four of them may be met with.

Now, as to the method of obtaining a practical distinguishing knowledge of these few snakes. Let advantage be taken of the first opportunity of killing a snake suspected to be one of them. If, by the presence of the "pit" or of fangs, it is determined to be venomous, note carefully such peculiarities of markings and form as may be most readily observed in other specimens of the same when seen alive in their native haunts. The specimen should then be preserved in spirits, so as to be available at any time for comparison with harmless species to which it bears a superficial resemblance.

Our venomous snakes, exclusive of the rattlesnakes, are comprised in two genera, *Ancistrodon* and *Elaps*. In either genus there is but one pair of fangs—long, slender, recurved teeth, situated in the forward portion of the upper jaw. In the genus *Ancistrodon* the fang is concealed in a fold of the gum, so that it is unsafe to presume upon its absence from a mere inspection. It must be pried out into sight by some sharp-pointed instrument. In this examination the greatest care should be exercised, as the venom continues to be secreted for some time after the death of the reptile, and a wound from the fang would probably at any time cause severe inflammation, if nothing more serious.

The fangs in the genus *Elaps* are permanently erect, smaller, and situated further back than in *Ancistrodon*.

The "pit," above mentioned, is a small cavity about midway between the eye and the nostril, and a little below the line joining them. While not common to all venomous snakes, it is seen only in those which are venomous; so that its observance will often obviate the necessity of looking for fangs.

To those who lack time for gaining such a practical knowledge of our serpents, the following fact in regard to them may be of interest. All snakes of uniform color upon the upper surface of the body, or marked with longitudinal bands or stripes, are innocuous. F. W. CRAGIN.

### Long Distance Telephoning.

An interesting trial was made with Bell telephones, Dec. 26, between Dayton, Ohio, and Indianapolis, Indiana, a distance of 108 miles. The wires of the American Union Telegraph Company were used, and the experiment proved conclusively the utility of Bell telephones for distances within 100 miles. Conversation between the exchange offices of the two cities was maintained throughout the day. A circle of 100 miles radius, with New York as a center, includes all the western part of Connecticut as far as New Haven, with its numerous large and growing towns and cities; the Hudson River cities as far as Hudson, taking in Poughkeepsie, Newburg, Sing Sing, and other large places; all the cities and towns of New Jersey; Wilmington in Delaware; and Philadelphia, Reading, Easton, Scranton, and other large places in Pennsylvania. A slight addition to the radius, still without much exceeding the distance between Dayton and Indianapolis, includes Hartford on the northeast and Baltimore on the southwest. All these great centers of population and trade are thus already within possible telephonic reach of New York; and it is quite within the limits of possibility that the end of the current year may see business men in this city dealing directly, by word of mouth, with customers scattered over all this wide reach of country.

### South American Exhibition.

The United States Consul at Buenos Ayres, in a dispatch to the Department of State, dated October 21, 1879, announces that a Continental Exhibition will be opened in that city on September 15, 1880, to continue until December 15 of the same year. The Exhibition is to be divided into six sections. All the nations of South America can contribute to and compete in the Exhibition; but the United States and Europe are limited to one section for machinery only. This section is divided into eleven groups, consisting of hydraulics, mining, metals, casting of types, bookbinding, agricultural implements, and several other groups. The usual directions to exhibitors have been published in pamphlet form.

### Goods for the Melbourne Exhibition.

Mr. Thomas R. Pickering has been named by the Secretary of State, at Washington, as agent for the United States Government to solicit exhibits for the Melbourne Exhibition, to begin October 1, 1880. Mr. Pickering's office is in room 102, Post Office Building, New York city, where information in regard to the Exhibition can be had. The United States will not assume the expense of shipping goods, but will, through their commissioner, receive goods at Melbourne, find them place in the Exhibition buildings, and publish a list of the exhibitors.

### Cactus Fiber.

A species of dwarf cactus abundant in Lower California is rich in fiber, said to be excellent for mattresses. It is reported that an experimental machine, costing only $400, converts the raw material into white, elastic fiber with great rapidity, and promises to reduce the cost and improve the quality of such goods very materially.

### How Connecticut Manufactures are Booming.

We learn that the Wheeler & Wilson Sewing Machine Company, of Bridgeport, Conn., has at present on hand orders for ten thousand sewing machines in advance of the capabilities of their immense establishment.