ly diluted with water, and electrolyzed with two Bunsen elements. Sodium and potassium sulphides cannot be used, at least not in a dilute solution.

Determination of Platinum.—The compounds of platinum are readily decomposed by the galvanic current, the metal being deposited at the negative electrode. A single Bunsen element is sufficient. Platinum can be determined in its salts by slightly acidulating the solution with hydrochloric or sulphuric acid, or mixing with ammonium or potassium oxalate and electrolyzing at a gentle heat.

The inaccuracy of the determination of potassium as platinum potassium chloride is well known. It might be preferable in accurate determination of potassium (ammonia and nitrogen determinations) to determine the platinum by the electrolysis of its double salts, especially as the separation of the platinum takes less time than the desiccation of the platinum compounds.

Separation of Iron from Cobalt.—The solution of the double oxalates is electrolyzed by means of two Bunsen elements connected in tension, the total weight of both metals is determined, and then the iron is estimated volumetrically. In carrying out the process, the solution is mixed with a few c. c. of potassium oxalate, (1 : 3) from 2 to 4 grms. of ammonium oxalate according to the quantity, and the liquid is then electrolyzed at a gentle heat. The electrolysis is complete in from three to five hours. On titrating the solution of the two metals nickel sulphate must be added to compensate the red color of the cobalt.

Separation of Iron and Nickel.—The process is exactly as in the last mentioned case. Iron and nickel separate out in the form of a white alloy, which dissolves slowly in hot hydrochloric acid. The solution is then oxidized with hydrogen peroxide, and after expelling excess the ferric chloride is titrated with stannous chloride.

Separation of Iron and Zinc.—If the double oxalates are electrolyzed there is deposited at the negative electrode, not an alloy, but zinc with a little iron. The process goes on smoothly, and the sum of the two metals can be readily determined if the zinc is less than one-third of the iron. If the proportion of the former metal is higher, the determination is impossible, as the zinc redissolves, with an abundant escape of gas, and ferric oxide is precipitated.

Separation of Iron from Uranium.—A large excess of ammonium oxalate is needed. The reduction of the iron is quickly effected by means of two Bunsen elements. Stronger currents are not to be recommended. After the determination of the iron the solution of uranium is freed from oxalic acid by further electrolysis with stronger currents, and the ammonium carbonate is driven off by heat. The finely divided uranium precipitate is dissolved in hot nitric acid and thrown down with ammonia.

Separation of Zinc and Chromium.—The quantitative separation of zinc and chromic oxide is readily effected by means of a small excess of ammonium oxalate and a current of about 10 c. c. of detonating gas per minute. To determine the chrome, the oxalic acid is destroyed and the chromium oxide peroxidized by continued electrolysis, the liquid is boiled, reduced again with alcohol and hydrochloric acid, and the chromium oxide precipitated.

Separation of Zinc from Uranium.—The separation is effected by means of two Bunsen elements with a large excess of ammonium oxalate. After removal of the zinc the uranium is determined as above.

Separation of Chromium Oxide from Uranium.—The separation depends on the electrolysis of the double ammonium oxalates and oxidation of the chromium sesquioxide to chromic acid by the current. The uranium is precipitated as hydroxide, and the chromium remains in solution as ammonium chromate. The electrolysis must be continued until the oxalic acid is totally decomposed. The liquid is then boiled, allowed to stand for six hours, and the chrome determined as above.

Separation of Cobalt from Chrome.—This process resembles the separation of zinc and chrome. The cobalt is separated from the solution of the ammonium double oxalates, and the chrome is determined as above. As the cobalt is entirely separated before the oxidation of the chrome begins, the current should be interrupted after its deposition, as it may otherwise be redissolved by the ammonium hydrocarbonate.

Separation of Cobalt from Chromium and Manganese.—After the separation of the chrome the solution is further electrolyzed for the decomposition of the oxalic acid and the peroxidation of the chrome, and is then boiled for some time. Hydrogen peroxide or bromine water is then added; the liquid is rendered alkaline with potassa, and the manganese is determined as sulphate or as manganomanganic oxide. The filtrate is then treated as in the separation of zinc from chrome.—*Berichte der Deutschen Chemischen Gesellschaft.*—*Chem. News.*

ON THE CHANGES PRODUCED BY MAGNETIZATION IN THE LENGTH OF RODS OF IRON, STEEL, AND NICKEL.*

By SHELFORD BIDWELL, M.A., LL.B.

THE earliest systematic experiments on the effects produced by magnetization upon the length of iron and steel bars are those of Joule, an account of which is published in the *Phil. Mag.* of 1847. Joule's experiments have been many times repeated, and his general results confirmed. In particular, Prof. A. M. Mayer carried out a series of very careful observations with apparatus of elaborate construction and great delicacy. The conclusions at which he arrived were in accord with those of Joule, so far as regards iron; in the case of steel there was some apparent discrepancy, which, however, might to a great extent be accounted for by differences in the quality of the metal used and in the manner of conducting the experiments. In 1882 Prof. Barrett published in *Nature* an account of some experiments which he had made, not only on iron, but also on bars of nickel and cobalt, with a view of ascertaining the effect of magnetization upon their length.

The knowledge on the subject up to the present time may be summarized as follows:

(1.) Magnetization causes in iron bars an elongation, the amount of which varies up to a certain point as the square of the magnetizing force. When the saturation

point is approached, the elongation is less than this law would require. The effect is greater in proportion to the softness of the metal.

(2.) When a rod or wire of iron is stretched by a weight, the elongating effect of magnetization is diminished; and if the ratio of the weight to the section of the wire exceeds a certain limit, magnetization causes retraction instead of elongation.

(3.) Soft steel behaves like iron, but the elongation for a given magnetizing force is smaller (Joule). Hard steel is slightly elongated, both when the magnetizing current is made and when it is interrupted, provided that the strength of the successive currents is gradually increased (Joule). The first application of the magnetizing force causes elongation of a steel bar if it is tempered blue, and retraction if it is tempered yellow; subsequent applications of the same external magnetizing force cause temporary retraction, whether the temper of the steel is blue or yellow (Mayer).

(4.) The length of a nickel bar is diminished by magnetization, the maximum retraction being twice as great as the maximum elongation of iron (Barrett).

In order that the results of Joule and Mayer might be comparable with those obtained by the author, he made an attempt to estimate the magnetizing forces with which they worked. From data contained in their paper, it was calculated that the strongest magnetizing force used by Joule was about 126 units, while the strongest used by Mayer did not on the highest probable estimate exceed 118 units. In the author's experiments the magnetizing force was carried up to about 312 units. The metal rods, too, were much smaller than any which had been before used for the purpose, ranging in diameter from 1.40 to 6.25 mm. Their length was in every case 100 mm., and the apparatus was capable of measuring with tolerable certainty an elongation or retraction equal to a ten-millionth part of this length.

By using thinner iron rods and greater magnetizing forces than those previously employed, the following curious and interesting fact was established: If the magnetization be carried beyond a certain critical point, the consequent elongation, instead of remaining stationary at a maximum, becomes diminished, the diminution increasing with the magnetizing force. If the force is sufficiently increased, a point is arrived at where the original length of the rod is totally unaffected by magnetization; and if the magnetization be carried still further, the original length of the rod will be reduced. It also appeared that the position of the critical point in steel depended in a very remarkable manner upon the hardness or temper of the metal; considerable light is thus thrown on the apparently anomalous results obtained by Joule and by Mayer. Further experiments disclosed strong reason for believing that the value of the critical magnetizing force in a thin iron rod was greatly reduced by stretching; this would explain the fact that Joule obtained opposite effects with stretched and unstretched wires.

By ascertaining the relative values of the temporary moments induced by gradually increasing external magnetizing forces, an attempt was made to connect the point of maximum elongation with a definite phase of the magnetization of the several rods in which the elongation had been observed.

Though more experiments must be made before it is possible to generalize from them with perfect safety, the results so far obtained by the author indicate the laws given below. The elongations and magnetizations referred to are temporary only; before the beginning of an experiment, the rod was permanently magnetized by passing through the magnetizing coil a current equal to the strongest subsequently used. In iron the greatest elongation due to permanent magnetization was generally found to be about one-third of the total elongation, while in nickel the permanent retraction amounted only to about one twenty-fifth part of the whole.

I. IRON.

(1.) The length of an iron rod is increased by magnetization up to a certain critical value of the magnetizing force, when a maximum elongation is reached.

(2.) If the critical value of the magnetizing force is exceeded, the elongation is diminished until, with a sufficiently powerful magnetizing force, the original length of the rod is unaffected, and, if the force is still further increased, the rod undergoes retraction. Shortly after the critical point is passed, the elongation diminishes in proportion as the magnetizing force increases. The greatest actual retraction hitherto observed was equal to about half the maximum elongation, but there was no indication of a limit, and a stronger magnetizing force would have produced further retraction.

(3.) The value of the external magnetizing force corresponding to maximum elongation is for a given rod approximately equal to twice its value at the "turning point."

Definition.—The turning point in the magnetization of an iron bar is reached when the temporary moment begins to increase less rapidly than the external magnetizing force.

(4.) The external force corresponding to the point of maximum elongation increases (when the quality of the iron is the same) with the diameter of the rod. So also does its value at the turning point.

(5.) The amount of the maximum elongation appears to vary inversely as the square root of the diameter of the rod, when the quality of the iron is the same.

(6.) The turning point, and therefore presumably the point of maximum elongation, occurs with a smaller magnetizing force when the rod is stretched than when it is unstretched.

II. STEEL.

(7.) In soft steel magnetization produces elongation, which, as in the case of iron, increases up to a certain value of the magnetizing force, and afterward diminishes. The maximum elongation is less than in iron, and the rate of diminution after the maximum is passed is also less.

(8.) The critical value of the magnetizing force for a steel rod diminishes with increasing hardness up to a certain point, corresponding to a yellow temper; after which it increases, and with very hard steel becomes very high. There is therefore a critical degree of hardness for which the critical magnetizing force is a minimum; in steel of a yellow temper the value of the criti-

cal magnetizing force is lower than in steel which is either softer or harder.

(9.) In soft steel a strong magnetizing force subsequently diminished may cause a greater temporary elongation than the diminished force is capable of producing if applied in the first place.

(10.) A temporary elongation when once produced in soft steel may be maintained by a magnetizing force which is itself too small to originate any perceptible elongation.

III. NICKEL.

(11.) Nickel continues to retract with magnetizing forces far exceeding those which produce the maximum elongation of iron. The greatest observed retraction of nickel is more than three times the maximum observed elongation of iron, and the limit has not yet been reached.

(12.) A nickel wire stretched by a weight undergoes retraction when magnetized.

THE RESOURCES OF ALASKA.

By FREDERICK SCHWATKA.

THIS distant colony of ours is now in that transition state where, having advanced far enough to know that it has valuable resources, it has not gotten so far that interested immigration associations and semi-organized financial adventure are pressing the coming citizen and capitalist to look at these industries through the microscope of their circulars. This latter fact may be due to the influence of powerful corporations with fixed monopolies producing government apathy, so that no government at all existed until last year on which the minor industries could found a basis for existence. Alaska is square shaped, with two horns projecting from the southeast and southwest corners, the former called Southeastern Alaska, the latter being the Aleutian Islands. This southeastern horn is the place where is congregated nearly all the white population engaged in those industries over which the government has thrown no special protection.

Nearly all of Alaska south of the Arctic Circle may be said to be well covered with timber, except an immaterial portion facing Behring Sea and the Aleutian Islands, although in the broadest sense none of it is fit for more than local use except Southeastern Alaska, and most of this, from its remoteness, can never expect to compete with the more valuable and vast timber fields of British Columbia, Oregon, and Washington Territory until, in the far future, the latter are exhausted. There is one exception to this general rule, however, in a very valuable kind of timber found near the tip of the southeastern horn, and extending into British Columbia along the Pacific coast. I refer to the yellow cedar of Alaskan parlance, *Cupressus nutkanaensis* of scientists. For a number of years it has been used on the northwest coast as a "fancy wood," from its exceeding fine, hard texture, great durability, an odor which, though agreeable to the *genus homo*, is a sure preventive to moths, and other good qualities for cabinet making, special wood work, and so on. The yellow cedar attains enormous size compared with the dwarfed species by which it is surrounded, often reaching a height of over a hundred feet and corresponding diameter at the butt, shown by the conifer family. When I was in Boca de Quadra Inlet, Alaska, not far from Dixon Entrance, that separates this territory from British Columbia, we had to unload sixty-five tons of freight at a salmon cannery there, and this was done in two loads by a raft made of two logs of yellow cedar not yet thoroughly seasoned. I thought they were ten feet at the butt, so grand were the logs, but probably two-thirds that would be about the truth. Even in the region that this extremely valuable tree occupies—the lower third of Southeastern Alaska—it is not found in large districts, either in compact forests or straggling cases among other kinds, but rather in little isolated groups or patches here and there, ten acre and hundred acre lots, so to speak; but once found, this patch is quite densely populated with them. This would really be greatly in its favor in securing these "groups" as timber land. Some of them, however, are quite large, and many have never been well outlined, and others, no doubt, are yet to be discovered in this almost wild country. Most of it grows near the water, and this phase in an Alpine country cut up by numberless channels and inlets of water running in every direction and creating thousands of islands may be readily appreciated. Near by the old Russian towns the clumps have been exterminated by them before we came in possession of Russian America; and had they held it, I have but little doubt it would now be worked on a large scale, or monopolized by some Muscovite favorites. While living in Oregon and the adjacent Territories, I often heard these valuable fields of timber discussed by parties who desired some law to protect them in securing them, and I was more than impressed with their sayings when I afterward visited the districts.

Our present financial depression, with capital seeking no new ventures, falling just as Alaska was given some form of law, and the probability that no surveys or methods of getting at these districts even in the rough law applied, has probably left these yellow cedar fields in much the same status as the past. I look on the industry based on this timber as one of the future "bonanzas" of Alaska, and the only one in the line of timber.

I have spoken of a salmon cannery in Boca de Quadra Inlet, and may add that a number of these industries are scattered here and there in the southeastern horn. They seem to be growing in numbers steadily, which would indicate prosperity. They are graded below Columbia River salmon in quality and price, but the cost of catching is so much less that I think they make more per case, over 20,000 cases having been shipped in 1883. These waters swarm with salmon during the summer, and the main objection against the industry in this district is the inferior quality of fish compared with those of Oregon, which will always be against very high profits, however cheap they may be able to get the fish.

As the data to the salmon industry is more accessible in this part of Alaska, I will pass, with the above few remarks, to a district where much less is known, and where, I think, the prospects are much better. I refer to the large rivers of Alaska, and especially those emptying into Behring's Sea, the Yukon, Koskoquim, and others, whose waters have not even been prospect-

* Royal Society, April 28.

ed with this idea in view. From the fact that all the important salmon canneries of the Pacific coast are on the larger rivers, the Fraser of British Columbia, the Columbia of Oregon and Washington, and the Sacramento of California, while none worthy of mention exist on the smaller streams, the same might have been inferred in Alaska, and thus drawn attention to these rivers, even if they were so remote and apparently inaccessible. I descended the Yukon River its whole length, 2,045 miles, in 1883. At 2,000 miles from its mouth, salmon commence appearing in sufficient quantities to enable the Indians to live upon them in the summer, while running, and put by a small quantity, smoked and dried, for later use. The amount thus preserved steadily increases as one descends the great river, and as the natives increase in numbers, until at about 500 or 600 miles from the mouth to that point the natives live almost wholly upon fish the year round, besides feeding large numbers of their dogs upon them. The drying yards of the native fishermen on the lower river are simply acres in extent, and it seems folly to me to attempt to estimate the amount, except by allowing wide margins for approximation. One person roughly estimates the catch on the Alaskan rivers at 10,000,000. Allow half that to be correct, and we see that the amount annually taken from the Columbia—about 600,000 cases, three fish to the case—and which requires most rigid laws to prevent extermination, would have no appreciable effect on this great northern river, the Yukon.

There are very few white traders on the lower Yukon in the employ of the Alaska Commercial Company, who, keeping their own dogs, purchase salmon of the natives for their winter's maintenance. The natives catch them in traps and weirs, clean them, slice them longitudinally, so they will dry faster, put them on trellises to dry, store them away in their caches, and when winter comes on take them out, sledge them to the trader's store, and sell them for one cent apiece in trade, which means two or three mills! Transferring the Columbia River catch to the Yukon, with the difference of price in the fish, would show a saving of so much over a million dollars that the increased cost of canneries, shipping to and from, etc., would not lower it much below that sum to show as clean profit over that on the Columbia. I saw at least a half dozen fine sites near the mouth of the Yukon, fulfilling all requirements demanded by a canning establishment, as far as water, wood, and minor accessories are concerned, a number that could undoubtedly be increased by a person searching with that object in view. The best quality of the Yukon River salmon is said to excel the Chinook salmon of the Columbia River, and so I thought when there; but am willing to acknowledge that a person just ending a long exploration on the roughest fare may not be in the best condition to judge, and may be conscientiously deceived. I believe the best variety is called the "king salmon," with a pinkish, firm, hard meat, and weighing double the Chinook of the Columbia. They comprise, roughly estimating, about one-fifth of the catch of the natives, who treat them the same as the others; one variety, however, the dog salmon, being fed only to their dogs, except in cases where they are pinched for food. The king salmon catch, therefore, could be made equal to that of the Columbia River, giving the other secured to the natives who would be employed as fishermen. Another variety, however, comprising about two-fifths of the native catch, locally known as "red back," I believe, are claimed to equal the Chinook salmon, but I am inclined to think they might be graded a little lower.

The Roskoquim, south of the Yukon, and the Kowak, north of it, are large rivers also, and said to be as good in salmon canning prospects as the Yukon, although I never personally visited them. I feel confident that the salmon fisheries of Alaska, in their entirety, the merest portion of which has been invaded so far, are as superior to those of the northwest of the United States proper as they are superior to those of California; or, in short, that they are the most important in the world. I might say, in closing the salmon subject, that the mouths of all the Alaskan streams emptying into Behring's Sea, which is very shallow on its eastern shores, have built up ugly bars with river sediment, and these must be noticed in calculations about commerce with any industry on the streams themselves. None of them are fatal, however, to such schemes, but simply hinderances of greater or less magnitude to be overcome.

The whale fishery of Alaskan bays and contiguous waters is just the reverse of the salmon fishery, in the knowledge of it by the public; that is, its most important whaling grounds are well known and thoroughly invaded, yielding us an average income of about \$1,000,000 per year. All data and statistics of the North Pacific whaling fleet can be so easily procured in San Francisco that I will not follow them up, but in dropping the subject I should say there is getting to be a tendency to establish whaling stations along the Alaskan coast, which by the utilization of natives as whalers allows small capital to enter this field, heretofore held only by those who could fit out ships. Whales were caught for their oil at Killisnoo, Southeastern Alaska, and found profitable, but experiments with other fisheries set them to making herring oil and drying codfish, where from 2,500 to 5,000 cases are annually turned out, of a quality said to be superior in every way to that of the East. In its cod fisheries Alaska is undoubtedly destined to lead the world, if supply and accessibility are worth anything in computation. I have spoken of the shallow shores of eastern Behring's Sea, and these submarine plateaus, the largest in the world, extend in almost every direction from Alaska's shores, and simply swarm with codfish. To compare them with the Atlantic banks would be like comparing the population of China with that of the Hudson Bay territory; none of them would make a coupon to the cod banks of Alaska. Some of the Alaskan natives live on these fish the year round, mixing them, singularly enough, with the dwarfed potatoes they raise in little patches. The Shumagin Island banks are the favorite ones, and from here they extend westward to nearly 170° west longitude (as now located, but probably beyond) into the Arctic until navigation becomes unsafe, and to British Columbia on the south. On the Shumagin Islands an infant industry is established, on a small scale, catching about 1,000,000 a year with but little over a half dozen men, their daily catch per man being 200 or 300 cod, while double that number

are often secured. The fish are taken to San Francisco to be cured, and this degrades their quality, a process that more wholesale methods of dealing would obviate. The only element now against the Alaskan cod banks is the demand, which has heretofore been only the Pacific coast, and that in a very restricted sense. With the competition of the Northern and Canadian Pacific, and projected roads to the Northwest, and the resumption of business prosperity, it is probable that this industry may share some of the latter. While there never will be a "bonanza" in the cod fisheries that is probable in the salmon of the Yukon, and the cedar of the southeastern horn, it will always be the cornerstone of Alaska's wealth, when the population of the Pacific or cheap transportation eastward creates a demand for it.

One resource of Alaska that will always be a constant revenue to that territory, or those putting money into it, directly or indirectly, is to be found in its grand and easily accessible scenery of the southeastern part. For over a thousand miles from Olympia, Washington Territory, to Chilkat, Alaska, the tourist sails on the ocean, which, protected by the innumerable islands off this coast, becomes really a huge salt water river of that length, as quiet as a mill pond, be there a gale or a calm. The scenery is of the boldest Alpine character in these canal-like fjords, with just enough variety to prevent monotony on such a long tour. In fact, it is especially adapted to those tourists who for any reason are averse to physical exertion or seasickness, and it will not be many decades before the traveler who has not seen the inland passage to Alaska will not be considered as having his education of sight-seeing complete.

The fisheries of fur in Alaska have been, are now, and may always be the most important resource of that country, taken directly from the land itself, although the catch of sea-otters could hardly be so classed. As probably every one knows, the fur-seal fishery of the Pribylov group of islands (St. George and St. Paul), generally known with us by the name of "Seal Islands," is the most important. As more is known regarding this particular industry financially, or, better speaking, is supposed to be known, and as its entire profits are monopolized by a corporation having exclusive powers to kill these animals on the Seal Islands until the year 1890, I will pass to the fur fisheries, where less is generally known, and over which the government has thrown no special protection. Principally among the latter we find the sea-otter catch, with an annual output of about five thousand, representing a half million dollars in the wholesale market, and, as usual, with fancy furs, many times more by the time it reaches the hands of the last purchaser. The sea-otter extends along the southern boundary of Alaska from tip to tip of the two horns, although about the center of the extended group of the Aleutian Islands they seem to be the thickest, nearly half the annual catch being taken here within a radius that would be visible from the top of one of the hills of the central islands. Just at present the Alaska Commercial Company, leasing the Seal Islands, nearly monopolize the sea-otter catch, for the simple reason that no enterprise can be carried on in western Alaska unless it can secure sufficient capital to fit out a vessel, however small and short the time employed. The sea-otter catch of Alaska is worth more than half that of all other furs put together (the fur seals being excluded), after that the others coming in their order of value of catch, being marten (sable), black fox, beaver, red fox, cross fox, land otter, blue fox, mink, lynx, white fox, brown bear, muskrat, black bear, and wolf. Could cheap transportation be gotten to Alaska for that once numerous class of Western trappers, now mostly out of employment from their fields of operation having been obliterated by the encroachments of the more useful industries of civilization, and the repeal of an obnoxious law which prohibits a white man from directly taking fur-bearing animals in Alaska—a law made wholly in the interests of a single corporation—it is evident that the annual catch could be doubled and the money accruing therefrom distributed among many instead of one or two close monopolies. I understand from good authority that the present steamer lines may pass into hands that will make this possible, or at least nearer than it has ever attained. I might add also, in closing this subject, that the sea-otter fisheries are "worked for all they are worth," and any greater destruction would put them on the downward way to extinction—certainly in a financial sense.

For the small amount of Alaska that has been explored by those able to judge of its mineral capacities it might be truly said that the prospect of its taking rank among the mineral-bearing territories can be said to be fair at least. Until very recently people were prohibited from legally gaining any rights to mineral lands, and consequently those "prospects" that were good, but needed further verification to solicit capital, were legally strangled at once, if that verification called for an outlay of money. The law so recently thrown over Alaska coming on the same wave with the present financial depression, it is hardly fair to judge what good it may do until the latter is well past. On Douglas Island, in the southeastern horn, mines have been discovered of sufficient importance to build up the largest town in Alaska, Juneau, although of that floating character that is hardly fair to give it this reputation. One mine here is said to have the largest quartz mill in the world—120 stamps—while \$16,000,000 has been declined for it, owing to the prospects in sight. Anyone at all familiar with the character of the country in southeastern Alaska, and knowing that even a single productive mine had been found, might well hope that it was not an isolated case, for in no place in the world is prospecting carried on with greater difficulties. The steep, mountainous country, standing almost "on end," so to speak, is covered with a dense, almost tropical, jungle of forests and vegetation even on the steepest inclines, and these have been accumulating for years, apparently never rotting, until the labor of reaching the ground for prospecting purposes becomes a work that Hercules would sub-let. Indians, it is said, took the prospectors to the Treadwell mine near Juneau, referred to above, or it might have remained a secret for another century, as probably hundreds of others might, as they certainly could, be hidden even from the keen eyes of the natives. Occasionally an avalanche sweeping down the steep mountain sides lays bare a broad swath of land that can be examined, but otherwise, unless gold-bearing float or other indications point to

very circumscribed localities, prospecting in southeastern Alaska is most discouraging. The Treadwell ore is gold-bearing and is a light-tinted quartz, crushing easily. Many other less satisfactory mines exist in this district, but as they are all near the little settlements, not previously determined by their existence, it is fair to presume that many valuable mines are yet hidden in the less accessible parts; in fact, for the reasons given above, they may exist "under their very noses," for all they would know until they stumbled on them. Attempting to get inland in this part of Alaska is almost out of the question, as even the Indians seldom essay it for any purpose, owing to the obstacles named. That even these obstacles may be overcome in the not far future is very likely in the light of the past when gold is the inducement. When I crossed over to the head of the Yukon River through a pass in the Alaska coast range of mountains, I knew that prospectors had preceded me, but with what luck was unknown. This river, the Yukon, is 2,045 miles long. About 1,700 miles from its mouth, where a large affluent, the D'Abbadie River, comes in from the east, prospects of gold commence and last in varying amounts almost to the mouth of the river. I afterward ascertained that miners had gone up the D'Abbadie River 200 miles prospecting. Everywhere we found gold that gave ten to twelve "colors to the pan." Sometimes at the mouth of an incoming stream or in other favorable places it would amount to twenty "colors," and sometimes sink to three or four, but it seemed to exist everywhere, but in no place could it be traced to much better prospects. To the very head of the D'Abbadie it was the same, and one miner I afterward met, who had been in on this part of the river, said that this widespread diffusion of fine gold could even be traced up the sides of the steep hills. The Pelly River, a large tributary of the Yukon from the east, and about 1,500 miles from its mouth, is the only tributary of the great river where miners have found placer gold in paying quantities, and even this can only be inferred from their returning from year to year to work on this stream, the amounts they realize being unknown to the outside world. It certainly seems as if a concentration of the precious mineral could be found at some point or points, where so much was scattered over such a vast tract of country. The Rocky Mountain divide, with its gold-bearing belt, after reaching about sixty-three or four north latitude sweeps westward, crossing the Yukon along the "Upper Ramparts," and becomes the Alaskan range of mountains, finally fading away to the westward in the Aleutian chain of mountains. Where the Yukon cuts through, signs of mineral become a little more numerous. The Tanana, an immense tributary of the Yukon, probably a thousand miles in length and wholly unexplored, sweeps, according to Indian reports, along the foot-hills of this range, further westward, sending many little streams into the mountains themselves, and offering, I believe, from all the surrounding circumstances, the best field for prospecting in Alaska. It could be reached by descending the Yukon as I did in 1883. The current of the Tanana is very swift, a great obstacle in ascending it, but assuring a good deposition of placer gold if there be any. The Indians near the boundary, however, say they know a trail that leads to its head. The Scheffelin brothers prospected the lower Yukon the year I was upon it (1883), and I understood from the elder brother, the discoverer of the Tombstone mines of Arizona, that he found ounce diggings on the Melozecargut, that might well pay individual enterprise, but would not suffice for extended capital. Gold-bearing deposits on the Kenai peninsula were once claimed by the Russians, but they never seem to have met all expectations since.

Argentiferous galena mines have been worked in Golovin Bay, on the north shore of Norton Sound, and when I was near there in September, 1883, a sailing vessel, the Alaska, was loading with this ore for San Francisco. It was said to assay \$57 to the ton, and the supply seemed good. I afterward was told that the Alaska had never been heard from since. When at St. Michael's, on the southern side of Norton Sound, I was informed by an employee of the Alaska Company that the natives had shown him specimens of the same kind of ore taken somewhere between Golovin Bay and Unalachleet, and told him the supply was inexhaustible, they having become familiar with the ore by seeing it often at the Golovin mines, where they had been. I heard the story corroborated verbally, but never saw any of the specimens, which, I might add, I considered in its favor; for, had the report been a "put up job," Golovin Bay specimens, easy to secure, would no doubt have accompanied it.

Native copper for years has been brought down the Copper or Atna River of Alaska by the Indians, and from here found its way to many white people in the way of trade, and so on. The Copper River is not navigable, except in stretches, being full of rapids, falls, etc., by Indian reports at one place a glacier jutting into the stream. So far the Indians have prevented the whites from entering this valley far, and have refused to disclose the whereabouts of the mine. The river is said by them to have two principal forks, and each one heads in a lake. When I was upon the Yukon River, I was shown specimens of copper ore taken from the valley near the boundary, which at once indicated good azurite, or the blue carbonate of copper. It came from quite an extensive ledge cropping out. All the rest that is known concerning it is from Indian reports, but agree so well with what would be expected that I give them. This bluestone, they say, crops out here and there for a distance inland equal to a day or two's journey in the winter with dogs and sledge, or probably twenty to thirty miles; they then have the same appearance of a reddish stone for a like distance, and then they come to a lake in the mountains, where is found native copper in sheets, and where they get enough for arrow-heads, although they seldom visit it, owing to hostile Indians living about it. Geologically their reports agree well with facts. In the mountainous country, where igneous action has been at work since the copper was deposited, it has been smelted by natural operations, and appears in sheets as native copper, while the azurite or blue carbonate is in its original form of deposition, while half way between the heat, though not great enough to smelt, has driven away an equivalent of carbonic acid, leaving it as cuprite, or red oxide. If the deposits are anything near like the dimensions given by the Indians, this copper field must rival any district now known of that mineral. The Yukon is navigable well past this district, and large

quantities of Sitka spruce cover the country near it, from which coke could be made for smelting, while coal exists on the river a little lower down, though not tested.

Agriculturally, Alaska is poor, though hardy vegetables by extra care can be raised in some parts sufficient for local consumption, although, if other industries open lines of transportation, they too will be imported by them.

Stock-raising, however, seems perfectly feasible in most of the Aleutian Islands, and were it not for the

A KING'S GRAVE IN CABINDA, WEST AFRICA.

HANS PETERSEN writes as follows in the *Illustrirte Zeitung*:

By passing down the Kwilo River, the Loango, and the Lendana, Cabinda, is reached. This is the residence of King Fine, who is a rather talkative gentleman. He received us in an old uniform of a Spanish admiral, minus the trousers, which were replaced by an apron, and with him we visited the graves of his ancestors and predecessors. Whenever a celebrated

of the other corners in succession. The paper will then have the appearance shown in Fig. 3. Next, fold the paper successively in both directions, as shown in Fig. 4. The object of this operation is to perfect the creases. It will then be easy, in forming creases around the center, *c*, to pass from this figure to Fig. 5. This once effected, turn the paper over so that the angle, *c*, shall be situated at the upper part, and the four points beneath; and then, in the same way, pull out to the right and left the points remaining at the lower part, so as to obtain the form shown in Fig. 7. Upon pull-

A KING'S GRAVE IN CABINDA.

mosquitoes, other districts could be named for hardy breeds. The advantages of the Aleutian Islands are the monopoly of ranges without fencing, and advantages of assorting where there are many islands, the needlessness of branding, the abolishing of "round-ups," etc. The climate of this chain is phenomenal for so high a latitude, the coldest weather ever recorded—about fifty years ago—being two degrees above zero, and since the United States has had it, six degrees above was the coldest noted at any United States signal station upon them. The islands are covered with a perfect network of little streams, so that stock would have no great distance to travel to water, a cause of tough beef. Luxurious grasses grow in the valleys up to one's knees, while the rolling hills are covered with a shorter bunch grass up to 2,000 feet above the sea-level. During the shipping season in the summer and fall a steady northwest wind can be depended upon, materially assisting shipments to the United States ports lower down. I might add in closing that a very few cattle kept here for milk and butter by white people, em-

person of the tribe dies, the corpse is wrapped in a large quantity of thin fabric and placed in a large and high wagon of very rude construction, and having the appearance of a cage. In this wagon the body is kept for a number of years before it is buried. The wagon is then drawn to the grave, which is about thirty feet deep. The mourners drink enormous quantities of gin, waste much powder, and the corpse is placed in the grave. The gin bottles emptied in honor of the departed and the empty powder barrels remain on the grave as an indication of the greatness of the man who was buried there.

A MECHANICAL BIRD MADE OF PAPER.

THE object which we propose to describe, and which is due to Japanese ingenuity, is a paper bird that is capable of flapping its wings when it is properly actuated with the hands. The engraving in the center represents the object in operation, and the diagrams that surround it show the mode of manufacture.

A MECHANICAL PAPER BIRD.

ployes of the Alaska Company, were in conspicuously fine condition in September. Of course, a company must be large enough to control its own ships, etc., which would practically bar small capital from operating, at least until friendly larger companies had first started.—*Bradstreet's*.

Take a sheet of letter paper, and cut it so that it shall be about five inches square. Fold this sheet through the middle and angles so as to form the creases shown in Fig. 1. This done, fold the corners over as shown in Fig. 2, and form a crease from *a* to *b* only; and then proceed in the same way with the two sides

ing out the points, *d* and *f*, to the right and left, we shall have the bird shown in Fig. 3. The head of the bird is made by folding the point, *d*, over. On taking hold of this paper bird by the points, *m* and *n*, and causing these latter to successively approach and recede, a flapping of the wings is produced. The same motion may be obtained by grasping the bird at the point, *m*, and pulling the tail, *f*.—*La Nature*.

QUITO, ECUADOR.

THE population of Ecuador is about a million, and the nation owes twenty gold dollars per capita for every one of the inhabitants. Three hundred thousand of the population are of Spanish descent, 100,000 are foreigners, and 600,000 native Indians or persons of mixed blood. A correspondent of the N. Y. *Sun* says: The commerce is in the hands of the foreigners entirely, and thus have a mortgage upon the entire country. The Indians are the only people who work. Over the doors of the residences or the business houses, and both are usually under the same roof, are signs reading: "This is the property of an Englishman," "This is the property of a citizen of Germany," and so on, a necessary warning to revolutionists, who are thus notified to keep their hands off.

The Spaniards are the aristocracy, poor but proud, very proud. The mixed race furnishes the mechanics and artisans, while the Indians till the soil and do the drudgery. A cook gets \$2 a month in a depreciated currency, but the employer is expected to board her entire family. A laborer gets \$4 or \$6 a month and boards himself, except when he is fortunate enough to have a wife out at service. The Indians never marry, because they cannot afford to. The law compels him to pay the priest a fee of \$6, more money than most of them can ever accumulate. When a Spaniard marries, the fee is paid by contributions from his relatives.

Although the road to Quito is over an almost untrodden wilderness, it presents the grandest scenic panorama in the world. Directly beneath the equator, surrounding the city whose origin is lost in the mist of centuries, rise twenty volcanoes, presided over by the princely Chimborazo, the lowest being 15,922 feet in height, and the highest reaching an altitude of 22,500 feet. Three of these volcanoes are active, five are dormant, and twelve extinct. Nowhere else on the earth's surface is such a cluster of peaks, such a grand assemblage of giants. Eighteen of the twenty are covered with perpetual snow, and the summits of eleven have never been reached by a living creature except the condor, whose flight surpasses that of any other bird. At noon the vertical sun throws a profusion of light upon the snow-crowned summits, where they appear like a group of pyramids cut in spotless marble.

Cotopaxi is the loftiest of active volcanoes, but it is slumbering now. The only evidence of action is the frequent rumblings, which can be heard for a hundred miles, and the cloud of smoke by day and the pillar of fire by night which constantly arise from a crater that is more than 3,000 feet beyond the reach of man. Many have attempted to scale it, but the walls are so steep and the snow is so deep that ascent is impossible, even with scaling ladders. On the south side of Cotopaxi is a great rock, more than 2,000 feet high, called the "Inca's Head." Tradition says that it was once the summit of the volcano, and fell on the day when Atahualpa was strangled by the Spaniards. Those who have seen Vesuvius can judge of the grandeur of Cotopaxi, if they can imagine a volcano 15,000 feet higher shooting forth its fire from a crest covered by 3,000 feet of snow, with a voice that has been heard six hundred miles. And one can judge of the grandeur of the road