THE RACES FOR THE ASTOR AND KING'S CUP.

All things considered, the annual cruise of the New York Yacht Club for the year 1907 was the most successful event of the kind in the history of this famous institution. Incidentally, it served to show that in the United States the noble sport of yachting was never more flourishing than at the present time; for when the fleet started on the first day's run, from Glen Cove to New London, considerably over one hundred yachts were flying the pennant of the New York Yacht Club; the greater part of whom followed the fortunes of the cruise until the fleet was finally disbanded.

The event opened with a race off Glen Cove, followed the next day by a beat to windward through the waters of Long Island Sound to New London. The next day there was a reach from New London to Newport; and following that, on the third day, was another reach, to Vineyard Haven. Returning, there was a stretch of windward work to Newport, where, on Friday and Saturday of last week, two excellent races were sailed for the Astor and the King's cups, the former race being somewhat marred by the light and fluky character of the wind, and the King's cup race being favored with an excellent sailing breeze of moderate force. During the whole cruise there were races for nineteen special cups, a dozen of which were given by the flag officers of the fleet; two by John Jacob Astor, and one by King Edward, while four were challenge trophies. Over and above these, were forty-five class races, for many of which second prizes were offered.

The principal interest centered in the 90-foot schooner class and the new 57-foot sloop class. The former was represented by three famous schooners, the "Elmina," designed by Carey Smith; "The Queen," a new Herreshoff boat of last year, and the famous "Ingomar," also from the Herreshoff boards, which a few years ago made a clean sweep in a season's racing against the crack schooners of England and Germany. In this class, also, was the little schooner "Venona." The 57-foot class was represented by four exceedingly handsome sloops, all designed and built by Herreshoff this year. Three of these, the "Aurora," "Winsome," and "Istalina," were built up to the limit of the 57-foot rating and were practically identical boats. The fourth, and most successful from the prize-winning point of view, the "Avenger," was built with a view to securing the full advantage of the time limit, her rating being about 48, or just sufficient to bring her into the class. Her large time allowance, coupled with the fact that she was built with hollow spars, and had all the advantages of purely racing construction, caused the "Avenger" to win out against the three larger sloops on time allowance, generally with a considerable margin to spare.

The Astor cup for schooners was won in a light and rather fluky breeze by Rear Commodore F. F. Brewster's schooner "Elmina" after a close race against the "Queen" and "Ingomar." She beat the "Queen" by 1 minute and 16 seconds corrected time, and the "Ingomar" by 9 minutes and 59 seconds. The course was laid with the first leg to a mark off West Island, a distance of 6½ miles; the second leg to a mark off Block Island, 18 miles; and a home leg of 13½ miles, making a total course of 38 miles. Among the schooners, "Queen" led at the first mark, having taken 54 minutes, 58 seconds over the leg. "Ingomar" came next in 55 minutes, 54 seconds, and "Elmina" in 56 minutes, 19 seconds. "Queen" was still leader at the Block Island mark in 2 hours, 22 minutes, 57 seconds, followed by "Ingomar" in 2 hours, 26 minutes, 2 seconds, and "Elmina" in 2 hours, 30 minutes, 6 seconds. Here the wind softened considerably, and "Elmina" drew to the front, her time for the third leg being 1 hour, 58 minutes, 7 seconds, "Queen" being second in 2 hours, 10 minutes, and 16 seconds, followed by "Ingomar," 2 hours, 13 minutes, 44 seconds. On corrected time the "Elmina" beat the "Queen" by 1 minute, 16 seconds, "Ingomar" by 9 minutes, 59 seconds, and "Winona" by 20 minutes, 17 seconds.

Among the sloops, of which fourteen started, the "Avenger" was winner on corrected time, in 5 hours, 17 minutes, and 40 seconds. In her own 48 to 57-foot class the "Winsome" came nearest to the "Avenger," her corrected time being 5 hours, 24 minutes, 38 seconds. That the "Avenger" should have beaten the "Effort," as she did, by 13 minutes and 3 seconds marks her as a phenomenally fast boat, and proves that Herreshoff's hand has lost none of its cunning.

Although the race for the King's cup was inaugurated only last year, it has come to be as famous an event in its way as the race for the Astor cup. There were nine entries for the race, and seven crossed the starting line, the absentees being the "Weetamoe" and the "Effort." The race was sailed over one of the King's cup courses laid out last summer, the first leg being 12 miles, the second 11¼ miles, and the last leg 12 miles in length, making a total course of 35¼ miles. There was a fine breeze, and so much promise of more to come that the sailors had on oilskins in preparation for the thresh to windward. The "Queen" sailed the first leg in 1 hour, 46 minutes, 12 seconds, the "Ingomar" in 1 hour, 45 minutes, 33 seconds, the 57-foot "Istalina" took 1 hour, 59 minutes, 32 seconds, and the "Avenger" 2 hours, 7 minutes, 42 seconds. The second leg was a reach of 11¼ miles, and the "Queen" drew slowly away from "Ingomar," her time for this leg being 1 hour, 5 minutes, 53 seconds, and that of "Ingomar" 1 hour, 7 minutes, 45 seconds. The little "Avenger" actually made better time over this leg than the larger sloops. The race was finally won by "Queen" in 3 hours, 30 seconds, corrected time, the "Ingomar" being second in 3 hours, 34 minutes, the "Avenger" third in 3 hours, 43 minutes, 24 seconds, followed closely by the "Istalina," "Aurora," and "Winsome" of the same class, the last being the "Neola," whose corrected time was 3 hours, 51 minutes, 27 seconds. The coveted trophy, therefore, for this year goes to the "Queen," which last year finished far in advance of the fleet, only to lose the cup on corrected time to the sloop "Effort."

Automobiling and Health.

Interesting researches on the influence of automobiling on health have been recently made by A. Mouneyrat, and communicated to the French Academy of Sciences. After the favorable influences exerted by an automobile trip on the skin, the organs of respiration, blood circulation, and nervous system had been first ascertained by Dr. Legendre, the effects produced by the rapid air exchanges on such a trip, both on normal, anæmic, and neurotic persons, have now been investigated by Mouneyrat. He made many experiments during automobile tours lasting eight days, with an average speed of 25 miles an hour and a daily run of 60 to 125 miles, both in spring and in summer, when a striking increase in the number of red blood corpuscles was noted. In normal persons the number of blood corpuscles on the day of starting was found to be 5,200,000 per cubic millimeter, while as many as 6,700,000 were found after eight days. In an anæmic person 4,530,000 corpuscles were found on the day of starting and 5,300,000 after eight days, while in another anæmic person the number increased from 4,300,000 to 5,600,000. In the first person the percentage of red corpuscles would thus increase by about 29 per cent, in the second by 18 per cent, and in the third person by 30 per cent.

An automobile trip results therefore in a considerable increase of the percentage of red blood both in normal and anæmic persons. On the other hand, an excessive appetite also occurs. It is interesting to note that an automobile trip will produce the same effect as a stay in the mountains, the increase in the number of red blood corpuscles observed at a height of 1,200 to 1,800 meters being about equivalent. The trip induces deep sleep both in normal and neurotic persons; the latter, who normally sleep but little, rapidly becoming normal.

Hand Loom Weaving in India.

Hand loom weaving is making considerable progress in the Madras Presidency in India. Several factories have been established, the most important one containing forty to fifty looms, at Salem, under the direction of Mr. A. Chatterton, director of industrial and technical inquiries in the Madras Presidency. Here various looms have been installed to test their relative merits. So far an English hand loom with an automatic take-up motion has proved the best. These are manufactured in the School of Arts, Madras, where a loom with 54-inch reed space costs, exclusive of reeds and healds, 85 rupees ($42). The best reeds and healds come from England. The reeds are made of brass and the healds are fitted with steel eyes. In this loom cloths can be manufactured from yarn of coarse counts or a degree of fineness beyond that for which there is any considerable demand. It is understood that in the hands of a skilled weaver it can be used for any class of work that can be done on the native hand loom.

For the present, attention in the Madras Presidency is mainly directed to improvements in the methods of preparing warps and sizing them. Experiments in hand-sizing have proved a failure, and it seems almost certain that the present methods of sizing will have to be retained in any process of warping which may be devised. Already the use of warping mills is very common throughout the Madras Presidency, and in Salem, for instance, it is usual for weavers to get their yarn warped at a separate establishment where nothing else is done.

Roofing Paper Paint (according to R. Roedelius.)—Distilled coal tar 25 parts, distilled wood tar 18 parts, silicic acid 15 parts, magnesia 10 parts, linseed oil 6 parts, anthracene oil 6 parts, iron oxide 8 parts, oxide of lead 8 parts, silicate of soda 4 parts. At a temperature of about 212 deg. F., thoroughly mixed together into a syrup-like mass. This, applied thin, changes within 12 hours into a plastic cement, of gutta-percha-like quality, that is very weather resistant.

SOME NOTABLE GERMAN BRIDGES.

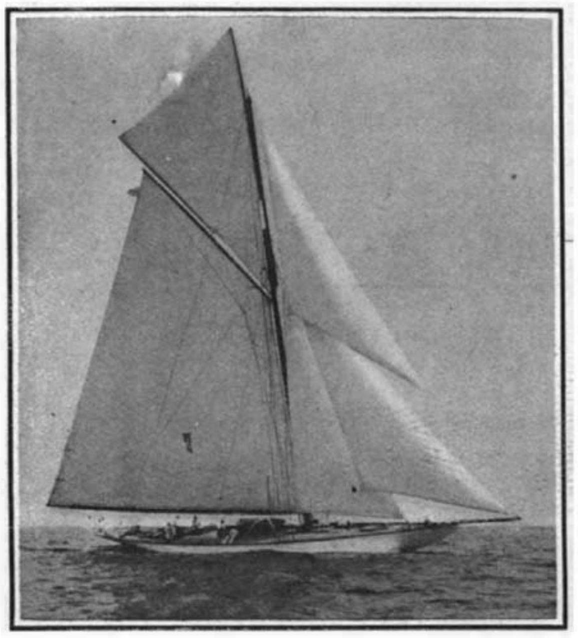
BY F. C. KUNTZ, C.E.

The accompanying illustrations of German bridges show what particular attention is paid to the esthetic appearance of bridges in Germany. Artistic taste and consequently the growth of art are the result of the continuous impressions we receive from the beautiful surrounding us. Beautiful public buildings, monuments, fountains, parks are as much the cause as the effect of the appreciation of art. The construction of a bridge in or near a city should be a welcome opportunity for a beautiful structure. We do not need any medieval towers at the ends of our bridges, as they would be meaningless to us. American rivers have been and are means of communication, not natural barriers like the historic Rhine, but there is a wide field between a medieval tower and an anæmic-looking end portal with a 5/16-inch web plate, a few punched holes representing the figures of the year of completion, a few punched rosettes and perhaps a bronze plate stating that the bridge is able to carry "a live load of 80 pounds per square foot of floor and a concentrated moving load"—and all that connected to the end posts of an unsightly Pratt truss with a few rivets, usually not strong enough to take the wind shear. The one is the work of an architect advised by an engineer, the other the work of an engineer trying to be a decorator. The only salvation is co-operation of engineer and architect, since it is impossible for any one man to master both branches of the art of building.

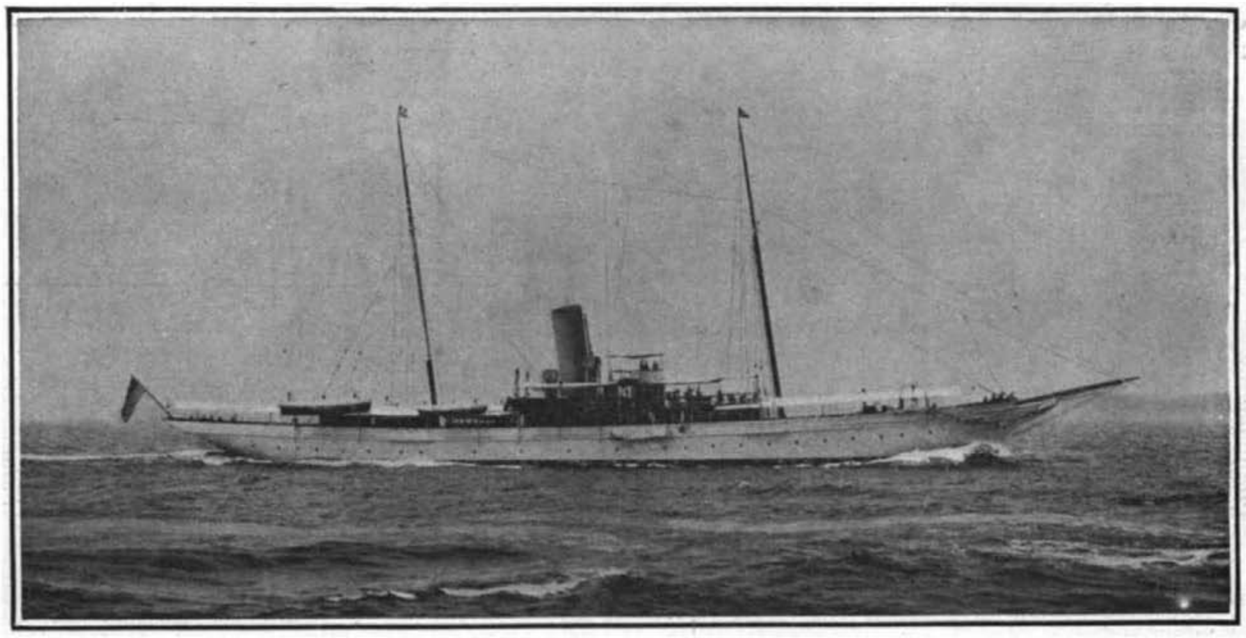
Up to the nineteenth century bridge-building was considered a part of architecture. The distinction between architect and engineer originated soon after the French revolution, when during the reorganization of the Académie d'Architecture in Paris a breach occurred between the "Decorateurs" and "Constructeurs." With the specialization of their work and the extensive use of iron for bridges and other structures the breach widened until finally the necessary mathematical training of the engineer made of him a hopeless utilitarian. In his address as president of the Institution of Civil Engineers, the late Sir Benjamin Baker, referring to the Firth of Forth bridge, remarked that, if engineering structures built on the line of utility and economy do not appeal to the artist, he has to change his requirements of their beauty. Similar ideas were expressed by many others, and they have had a wholesome influence on engineers and architects in wiping out useless construction and senseless ornamentation—we smile today at the highly ornamented guns, flying machines, and other "tools" of the eighteenth century; but it certainly is more than doubtful that because a statically incorrect structure is not rational and therefore not beautiful, a statically correct one is necessarily beautiful. Much more justified would be the expression that the correct but ugly structure is only partly correct.

The first of our front-page illustrations shows the highway bridge across the southern branch of the River Elbe at Harburg, built 1897-1899 at a cost of $420,000. It consists of four arch spans of 331 feet each, weighing 2,270 tons, and six deck spans of 102 feet, weighing 600 tons. The roadway has a clear width of 23 feet, accommodating one trolley track. There are two 8-foot sidewalks, carried by brackets outside of the trusses. The truss system is a "two-hinged" braced arch with a tension member under the floor, tying the two end hinges together. The tension in the tie replaces the horizontal resistance of the abutments against overturning, forming with the arch one elastic truss system exerting only vertical pressures on the supports. Uniform changes in temperature do not cause any stresses because the tie will change its length with the other arch members, provided one hinge is placed on rollers. The greatest advantages of the vertical pressure on the supports, however, occur in the case of several consecutive arch spans; as without the tie, the intermediate piers and their foundations would have to be very thick to resist the horizontal thrust resulting.

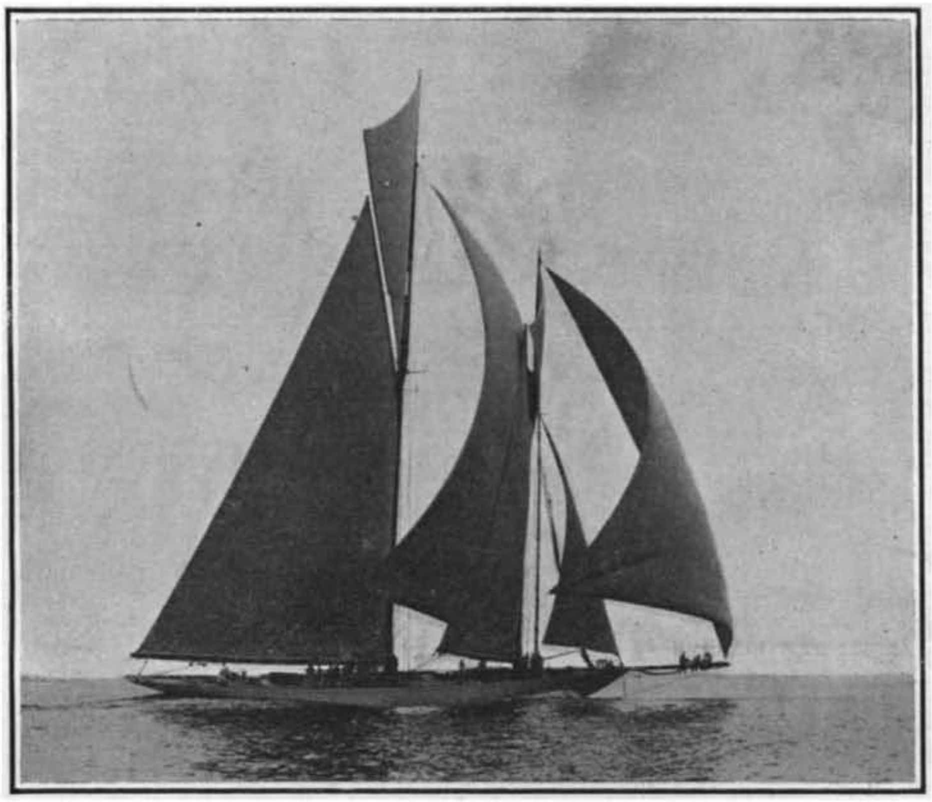
In this bridge the so-called "secondary"—usually neglected—stresses, caused by the customary rigid connections of the floor beams to the trusses, were reduced in making the floor system "freely suspended," so that its vertical elastic deformations are entirely independent of those of the trusses. Each floor beam is fastened to the suspenders by means of a pin instead of being riveted, with the only exception of the center floor beam, which is rigidly connected to the suspenders. The horizontal ties of the trusses and the lower horizontal wind bracing form thus a fixed line to allow the floor system to expand or contract toward both ends. For the same reason no vertical, but only a horizontal upper wind bracing is used. The lower horizontal wind bracing consists of stiff diagonals riveted to the two ties, but having no connection whatever to the floor beams, the wind force coming from the live load moving across the bridge being transmitted to the leeward tie by means



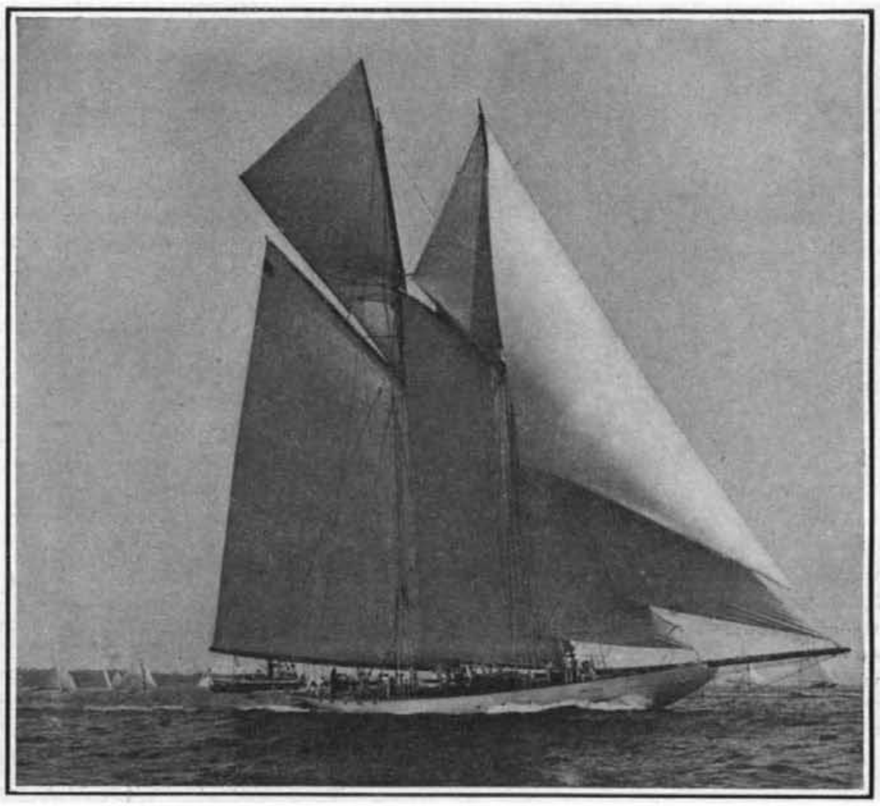
"Avenger," Winner of Astor Cup for Sloops.



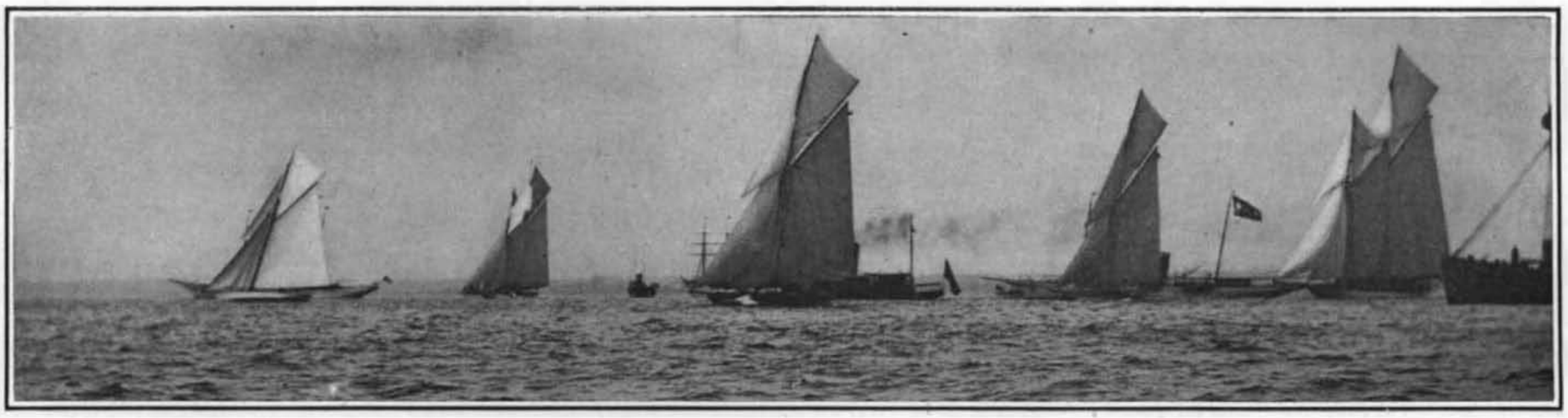
Commodore Cornelius Vanderbilt's Flagship "North Star."



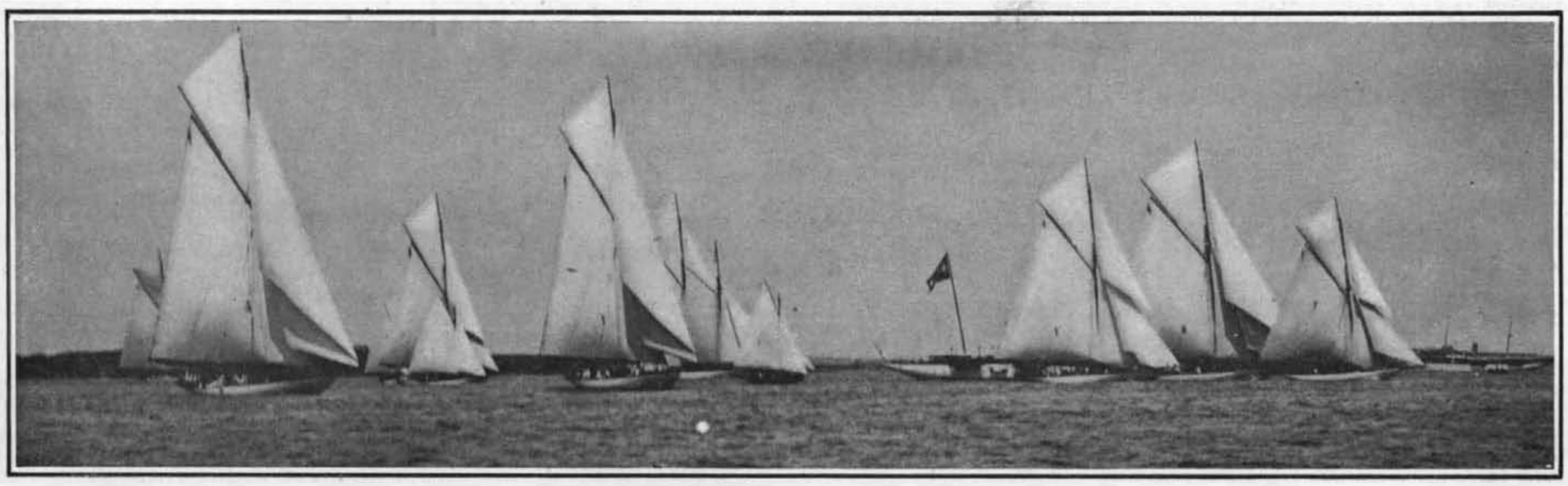
"Queen," Winner of the King's Cup.



"Elmina," Winner of the Astor Cup for Schooners.



Start of the Race Off Newport for the King's Cup.



Start of the Sloops for the Astor Cup.

THE 1907 RACES FOR THE ASTOR AND KING'S CUPS.

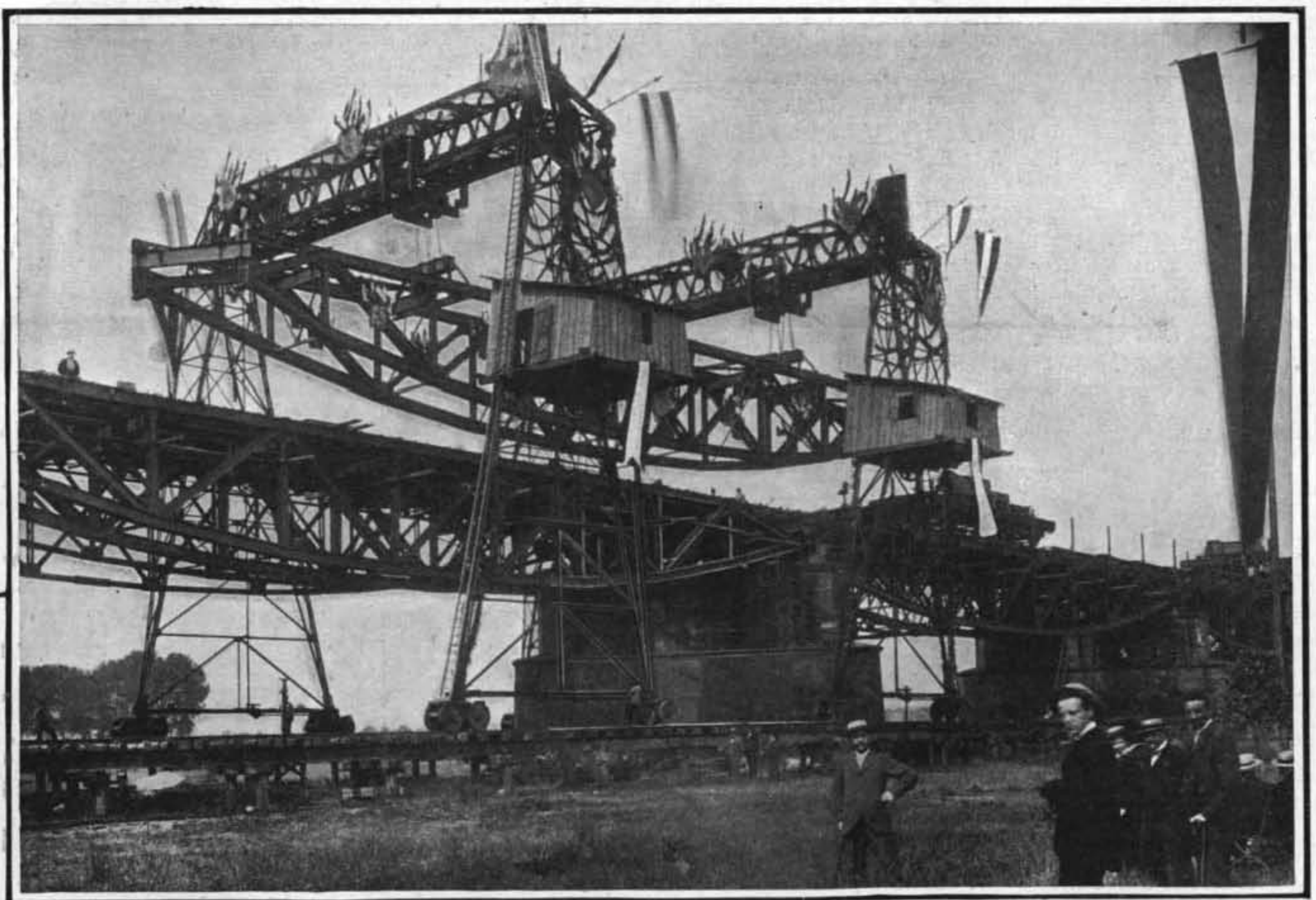
of a loose vertical butt joint formed by small projections of the bottom chord of the floor beam.

This fact is very interesting, showing that European engineers are adopting articulated connections in their briges—at least in a transverse direction—at a time when American engineers are abandoning pins and eye-bars in lighter bridges in favor of riveted connections for the sake of greater rigidity under traffic. This construction will hardly be copied in this country. A bridge should be a stiff structure in space, able to resist unforeseen shocks, stresses, etc., and not be stiff in a longitudinal and transversal plane independently. Stiffness, that is, freedom from excessive deflection with vibration, is just as necessary to lengthen the life of a bridge as is its strength expressed in so-and-so-many thousand pounds of permissible working stress per square inch under a probable live load; but it does not generally receive the attention it deserves, because it cannot as easily be defined.

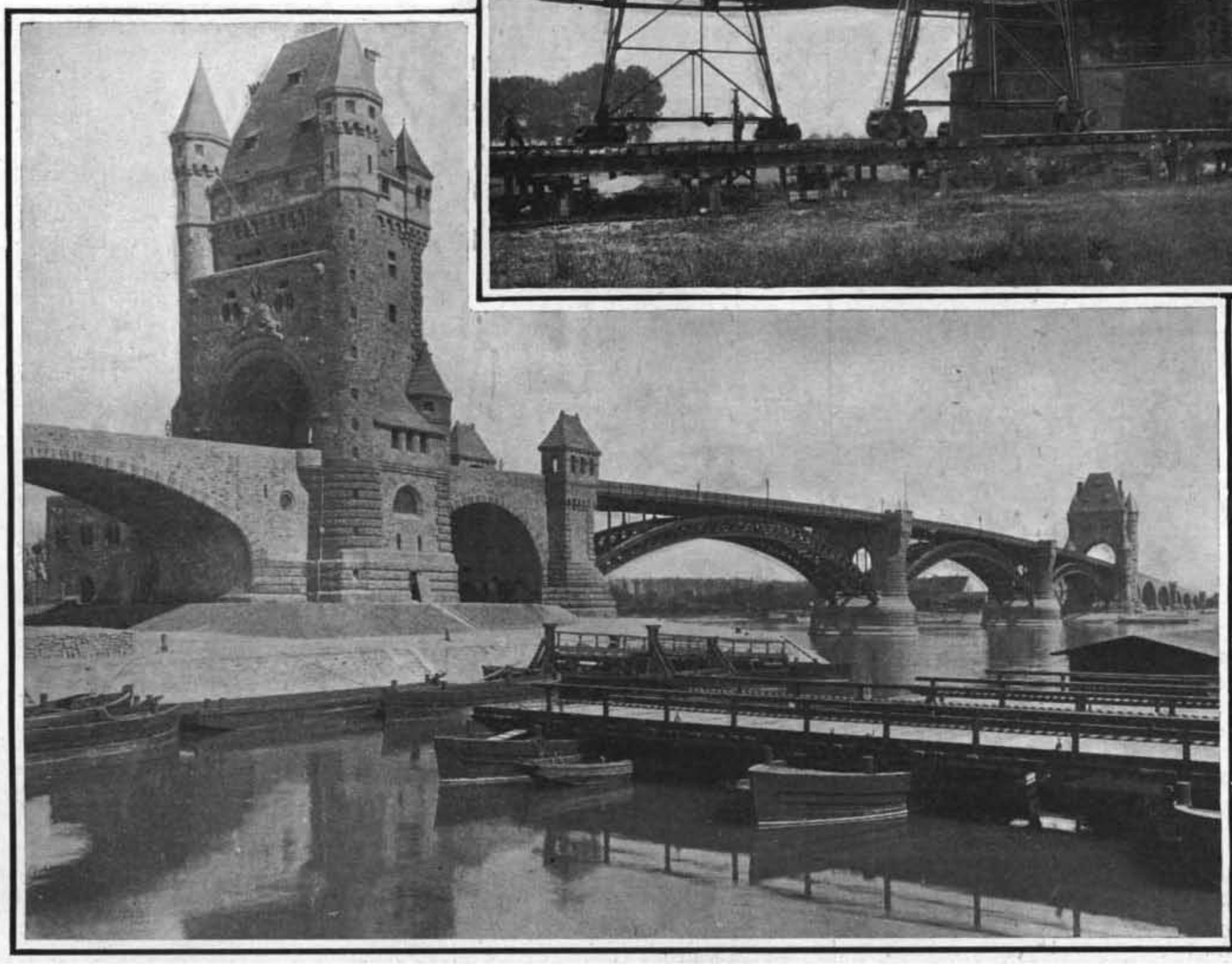
The lower front page illustration shows the railway bridge at Mainz which crosses two arms of the Rhine and an island, to accommodate two tracks and two sidewalks for the considerable length of 3,000 feet. It cost $1,300,000. The two river crossings consist of three and two arch spans respectively, the span lengths varying between 306 feet and 382 feet. The truss system is the same as in the bridge described above, that is, a braced arch with a tie connecting the end hinges. It is not clear why the river piers were not extended a little higher, as has been done, for instance, in the bridge across the Rhine at Düsseldorf (see SCIENTIFIC AMERICAN SUPPLEMENT, February 23, 1901), to prevent the stilt-like appearance of the steel structure at the piers. The viaduct across the island consists of six deck spans with parabolic trusses of 130 feet span each. In the accompanying illustration these trusses are shown being erected from a traveling gantry. The floor system is also here "freely suspended," which is even less commendable in this case, since the bridge carries railway traffic. The bridge being located at the gates of the old city of Mainz, whose history reaches back into ancient Roman times, special care was taken in the architecture of the abutments to express the strategic importance of this location in history, and it must be admitted with great success. The massive abutments are relieved below the floor by masonry arches while carrying above a superstructure of masonry composed of defiant medieval towers of great beauty.

Another view represents the highway bridge across the Rhine at Worms, built in 1897-1900. It consists of one center span of 346 feet and two side spans of 310 feet each, with a total steel weight of about 2,000 tons. There are masonry approaches on both sides, consisting of 12 concrete arches with 3 hinges and spans varying from 70 feet to 115 feet. The roadway is paved with wooden blocks on asphalt and has a clear width of 22 feet. There are two sidewalks 7 feet wide, each carried on brackets outside of the trusses. The arch trusses located entirely below the floor are 25 feet apart, have two end hinges and the shape of a crescent to indicate the concentrated reactions at the hinges. The rise of the center line is very small, being only about one-tenth of the span. To accentuate the boldness of the outline with a flat curvature in the center, giving also more clearance for the river traffic and at the same time keeping the hinges low to reduce the lever arm of the great horizontal thrust, the center line of the arch is an elliptical curve. The depth in center is about one-fiftieth of the span. Architecturally the bridge is a model. The arches being below the floor clearly show their static function, while the portals, treated as massive masonry towers, furnish the necessary horizontal stability, giving at the same time expression to the historic dignity of the place. The masonry is treated in a simple manner, to impress more with its massiveness than with small ornamental detail. If we were allowed to express a wish, it would be that the three river spans had been made a little longer and

Highway Bridge Across the Rhine Between Ruhrort and Homberg, Showing Method of Erection by Overhang.



Island Spans of the Railway Bridge at Mainz, Showing Erection of Trusses by a Traveling Gantry.



Highway Bridge Across the Rhine at Worms; a Fine Example of Correct Architectural Design.

SOME NOTABLE GERMAN BRIDGES.

the masonry arch adjoining the one tower on the river side left out, making the river crossing symmetrical, both towers accentuating the limits of the steel construction.

Another view shows the highway bridge across the Rhine between the cities of Ruhrort and Homberg during erection. The construction began in 1905 and will be finished this year at an expense of about $1,100,000. The width of the street is 53 feet between railings, and the distance between trusses 36 feet. The total length will be 2,000 feet, with a center span of 667 feet, which will make this the longest span in Germany, and, with only two exceptions, the longest in Europe; the larger spans being, in the Viaur viaduct in France, 722 feet, and in the Firth of Forth bridge in Scotland, 1,710 feet. A span of 667 feet is too long for an ordinary truss bridge, the longest so far built being 546 feet. An arch or suspension bridge would have been possible, but these were considered undesirable on account of the danger of settlements of the foundations caused by coal mines near the bridge site. The only system left was the cantilever, which exerts vertical reactions only, and this was adopted. The outlines of the trusses are very pleasing, which is indeed rare in cantilever bridges. It is interesting to note that in spite of the great weight, the trusses are riveted throughout, no eyebars or pin connections being used.

THE SHEEP-KILLING KEA.

BY GEORGE R. MARRINER, F.R.M.S., ASSISTANT IN BIOLOGY, CANTERBURY COLLEGE, NEW ZEALAND.

New Zealand has its full share of interesting animals, but with the exception of that strange out-of-date lizard-like animal, called by the Maoris the tuatara, the avifauna claims them all. The extinct moa, that giant of the bird world, is the only bird known that has not even a vestige of a wing; the little kiwi itself is almost wingless, and is the only bird known that has its nostrils opening to the exterior at the tip of its long beak; while among the migratory birds the godwit holds the record for long sea flights, for it flies from New Zealand to Siberia and back every year.

However, of late years the bird that has come to the front, owing to its strange habits, is the kea. This mountain parrot (*Nestor notabilis*) is somewhat larger than a pigeon, and its feathers are mostly dark green edged with black, while under its wings and on its tail its color is brick red. Its beak is very strong, and the upper mandible very much curved. The bird is confined to the South Island of New Zealand, where it lives among the peaks of the Southern Alps, which often rise from seven to over twelve thousand feet in height. However, it does not by any means always live near the summits of these snowclad peaks, but is most commonly found just about the forest limit.

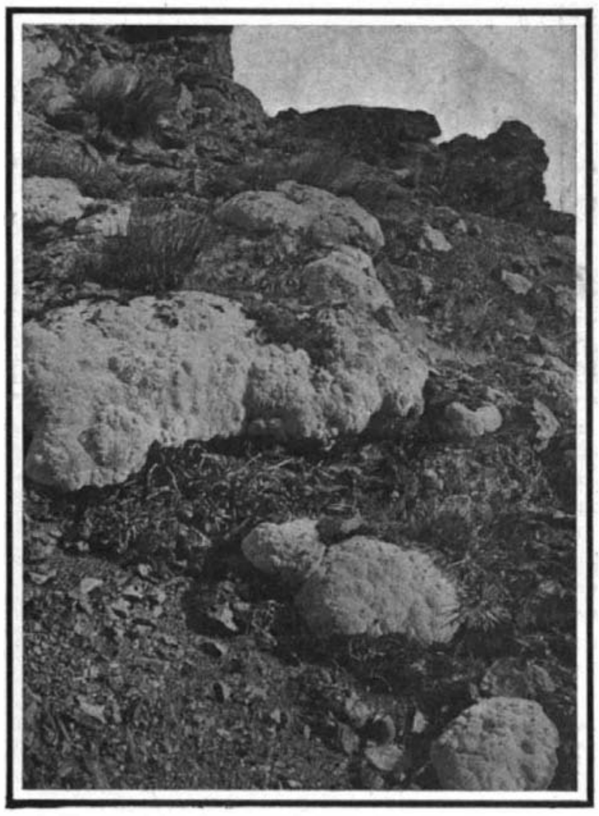
About thirty-eight years ago, a number of sheep were found torn about in a way that was quite unknown to the sheep farmers, and so a very close watch was kept. The result was that several keas were seen sitting on some sheep and pecking at the wool, and at another time several keas were seen sitting around a wounded sheep. At once the keas were condemned without any further proof, and the slaughter of these interesting birds which was then commenced continues until this day. This was the first and best instance recorded of the keas killing sheep, and when the evidence is sifted there is no absolute proof at all in the record.

This supposed change of an insectivorous and berry-eating bird to a bird of prey has been the cause of a long controversy between station owners and sheep farmers and the scientific men of the colony, who took the part of the kea.

When the writer took up the question in 1905, after reading through all the available records, he could not find one writer who saw the bird kill a sheep, nor was the name and address of any actual eye-witness given. Not only was the fact of the kea's change of habit of scientific importance, but the loss of thousands of sheep made it essential that the question should be once and for all time satisfactorily settled. The writer then set to work, and collected written accounts from men who had actually seen the bird killing and attacking sheep, and the result of this investigation is published in the Transactions of the New Zealand Institute, 1906.

Great care was taken to make the evidence authentic, and in each case the witness had to send in a written statement that he would be willing to swear to his evidence before a justice of the peace.

The reason why so few people have ever seen the kea at work seems to be due to the fact that the killing is mostly done at evening or early morning, at places which men seldom reach until long after the bird has finished its deadly work. Among my correspondents, over thirty men have actually seen the kea killing the sheep. These witnesses do not consist only of musterers and shepherds, but in many instances they are either managers of the sheep stations or the station owners themselves. Summing up the different accounts, which owing to limits of space cannot be published in full here, the birds' mode of procedure seems as follows: They may attack in ones or twos or in numbers, but usually one or two birds do the killing, and the others share in the spoil. The keas always seem to choose the pick of the flock. The bird



"Vegetable Sheep," Said to Account for the Sheep-Killing Habit of the Kea.

settles on the ground near its quarry, and after hopping around for some time, it leaps on its prey, usually on the rump. The movement of the sheep may cause it to fall off, but it persists until it has firmly perched itself on the sheep's back. Then the kea begins its operations by tearing out the wool with its powerful beak, and at last gets its beak into the flesh.

The sheep, which for some time has been moving uneasily about, gives a jump as the beak pierces the flesh, and then begins to run wildly about in vain efforts to rid itself of its tormenter. When, however, the sheep finds it cannot dislodge its enemy, it seems to become terrified with pain and fright, and rushes blindly about, usually at a high speed, the kea meanwhile holding on and balancing itself with outstretched wings. When the beast stumbles, the kea rises on its wings, and settles down again onto the sheep when it has regained its feet. This awful race is continued, until, bruised by its numerous falls, utterly exhausted by its death struggles, the poor animal stumbles to rise no more, and becomes an easy prey to the kea.

It has always been supposed that the kea attacked

THE NEW ZEALAND KEA, WHICH HAS ACQUIRED THE HABIT OF KILLING SHEEP.

the sheep for the sake of the kidneys, and the first man to dispute this, as far as I know, was Mr. F. F. C. Huddlestone. Dr. Alfred Russel Wallace, in his book entitled "Darwinism," after describing the method of the kea's attack, says: "Since then it is stated that the bird actually burrows into the living sheep, eating its way down to the kidney, which forms its special delicacy."

From the evidence of men who have seen many sheep killed and wounded by keas, this statement appears to be erroneous; and of the many correspondents that have communicated with me, only one states that the bird eats the kidneys, and later on, the same writer says: "I have shot many keas by the dead sheep, and they have vomited up fat." It appears as if, even in this instance, the birds eat the fat rather than the kidneys.

One reason why people suppose the kea to be fond of kidneys is that the keas nearly always attack the sheep on the loin, just near these organs. But this may be due to the fact that the rump of the sheep is its widest part, and provides a firm foothold for the kea. Several witnesses say that it is almost impossible for the kea to keep on the sheep's back unless he perches on this part. Furthermore, when flying after a sheep, the rump is the nearest and handiest part to settle on; and as the birds often have to alight on the sheep when it is running, it is no wonder that the rump is the part chosen. It naturally follows that when perched on the animal's hind quarters, the bird will commence to pick the sheep's back at the handiest part, namely, the loin, which is very easy to tear open, owing to the absence of ribs. Even the first recorded accounts of sheep killing mentioned that the birds attacked the loin. I can hardly believe, as some people do, that by some kind of instinct the kea knew where the kidney fat was to be found in the live sheep. This latter idea is somewhat upset by the fact that cases have been seen where the flesh around the backbone has been eaten, and the kidney and the kidney fat left almost untouched.

We now come to the interesting question as to how the kea acquired the habit of killing sheep and eating the carcasses. This can never be completely answered, but there are several theories which are well worth considering, as they throw a certain amount of light on the reasons for the bird's change of diet.

I. The *Vegetable Sheep* theory is certainly the most popular, though it has very little to recommend it. The supporters of this theory suppose that the kea had been in the habit of tearing open the "vegetable sheep," *Haastia pulvinaris* and *Raoulia eximia*, in search of grubs which are supposed to live in these peculiar plants. They are found especially in the northern half of the Middle Island at an altitude of from 4,600 to 6,000 feet, and in external appearance they somewhat resemble a sheep, growing as they do in the form of cushions often as large as sofas, and the whole surface having a woolly appearance. It was supposed that when the sheep first wandered into the kea's domains, the birds mistook them for the wool-like plants, and with the idea of digging out the grubs, they began to tear open the skin of the sheep. In this way the keas are supposed to have acquired the method of killing the sheep and eating the flesh.

This all sounds very feasible, but on further investigation, it is found that the true facts do not support the theory.

1. Where the keas were first known to kill sheep, the vegetable sheep do not exist.
2. There are no grubs in vegetable sheep that are large enough to attract the keas.
3. In places where both the keas and the vegetable sheep are found, the latter is never seen in a torn-up condition.

It seems to me that unless further evidence is forthcoming to support this theory, it must be left out of consideration.

II. The *Curiosity Theory* suggests that the kea, being a very inquisitive bird and fond of investigating anything at all strange that comes in its way, when it first saw the sheep wandering into its domain, at once began to investigate this strange object, and so learned to tear the sheep open.

III. The *Hunger Theory* suggests that lack of food caused the birds to feed on the fat and meat thrown away at the sheep stations. In this way it obtained a taste for meat, and soon became daring enough to attack the living example.

IV. The *Maggot Theory* suggests that the birds first began to eat the maggots found on the dead sheep, and soon learned to eat the meat and then to attack live sheep.

This theory seems to have much in favor of it, especially when we remember that the kea is naturally insectivorous. Again, the very fact that the birds seem fond of dead carcasses rather supports this theory. It is of course impossible to say which theory is nearest the truth, but I think that there is no doubt that the main factors that caused the harmless keas to change their diet and become birds of prey of no mean order are expressed in the last three theories.

In conclusion, I think that I am justified in saying that, as far as human evidence can be relied on, I have conclusively proved that the kea has not only taken to meat eating, but that it does actually attack and kill sheep for the sake of the meat and fat.