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Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

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THE SITE OF KARAKORUM.

AT the meeting of the Geographical Society of Paris held on the 23d of May last, M. N. Yadrintzef, the well-known Siberian traveller, read a paper upon the archæological mission in North Mongolia, with which he was intrusted by the Irkutsk section of the Imperial Geographical Society of Russia. The special object of the expedition, as we learn from the "Proceedings of the Royal Geographical Society," was to determine the exact site of the city of Karakorum, the ancient capital of the Khans of Mongolia, — a question which has long been in dispute ever since the visit of Marco Polo. M. Yadrintzef started from Kiakhta on the 10th of June, 1889, and followed the course of the Selenga to the point where it debouches into the Orkhon. The first ruins were met with on the river Tula; viz., those of the ancient abode of Irkhe-Merghan, son of Altai Khan, which dates back from the thirteenth century. Several parts of the ruins were in a very fair state of preservation. On June 23 the expedition visited the remains of an ancient Buddhist temple on the river Kharukha, the walls of which are still from twenty to forty feet high, and nine days later arrived at the celebrated ruins of Kara-Balgassun, situated on the left bank of the Orkhon, about thirty miles south of its confluence with the Urtu-Tamir. A close examination of these ruins convinced the traveller that they formed the remains of an ancient city, which must have covered an area six miles in circumference, and the centre of which, the Kara-Balgassun of to-day, was occupied by the principal palace of the Khan. Canals connected this city with the river Djirmanta. In the vicinity of the hot springs, near the latter river, the remains of baths were found. The position of the ancient capital of the Mongolian Empire can thus be accurately fixed, thanks to the recent astronomical determination of the situation of Lake Ughei-Nor, made by Col. Pievtzof. The lake lies in latitude 47° 47′ 23″ north, and longitude 102° 45′ 25″ east of Greenwich; and the position of Karakorum is, according to M. Yadrintzef, thirty miles to the south-east, or in latitude 47° 15′ north, and longitude 102° 20′ 15″ east of Greenwich. Another result of this expedition is the discovery of remains of the ancient habitations of the Mongols along the whole valley of the Orkhon. Several burial-grounds visited by the expedition were full of stones covered with inscriptions, bas reliefs, and obelisks. Most of the latter have Runic inscriptions and Chinese hieroglyphics. The tombs bear evidence of great antiquity, and apparently belonged to the ancient nobles of the country. A visit was also paid to the Buddhist convent of Erdenitzan, where an important religious festival was witnessed, in which more than two thousand lamas took part.

A DRILL TO CUT SQUARE HOLES.

THERE have been attempts at various times to devise a drill which would produce square holes as economically as round holes are drilled. The idea has been a favorite one with inventors, but hitherto no great amount of success has attended their efforts. Recently, however, machines for the purpose have been devised that work with some degree of success. Two of them are now on exhibition in London. As described in *Engineering*, they bear a general resemblance to drilling-machines; but the spindle, instead of revolving in close-fitting bearings, has a peculiar motion which causes it to cut out a square hole. In the earlier type of machine the spindle is fed down through a long rotating sleeve. This sleeve is made to follow a path of peculiar form by means of a cam at each end running in a square hole. The method of setting out the cams is thus explained: "A square hole is described equal to the hole to be drilled. From any point in one side of the square an arc of a circle is described with a radius equal to the side of the square. From the points where this arc intersects the sides of the square, other equal arcs are described, completing the curve triangle. The square in which the cam is to revolve is now drawn, and from each of the vertices of the curve triangle two arcs are described, which complete the figure shown. The point of the tool, which cuts with one edge only, must be situated beneath one of the angles of the triangle." There are a separate pair of cams and a separate tool for each size of hole to be drilled. Five sets of cams are fixed on the spindle, and any set of them can be placed opposite the bearing-plates. The later form of machine is simpler in its construction, and will drill any sized hole within the range which it covers. In the upper bearing there is a short hollow spindle which is driven by gearing. Through this spindle there passes a long hollow spindle, carried near its lower end in a ball-bearing which allows considerable freedom. At the upper end of the spindle there is a roller which runs in a fixed cam path, and is held up to it by springs, which connect the spindle with the hollow driving-spindle. The effect of this arrangement is, that while the spindle rotates, it also rolls round in the ball-bearing, and its lower end describes a geometrical figure. The drill-spindle proper is within the second spindle, and carries a cutter, the cutting edge of which terminates on the centre line of the spindle. As the central spindle is raised or lowered, it decreases or enlarges the size of the hole drilled, while the whole drill-head is lowered to give the feed.

HEALTH MATTERS.

Microbes in Hail-Stones.

BACTERIA of various kinds have been found in ice and snow; and Dr. Fontin, a Russian observer, has now proved that hail-stones are not free from them. He has found, says the *British Medical Journal*, that the water produced by the melting of hail-stones contains, on an average, 729 bacteria per cubic centimetre. Neither yeast fungus nor mould was present, but nine different kinds of