

Correspondence.

The Uncleverness of "Clever Hans."

To the Editor of the SCIENTIFIC AMERICAN:

In your article of September 24, on page 213, you published an article on a reasoning horse, calculated to make your readers believe that Von Osten's stallion, "Der kluge Hans," "is really what his owner claims him to be, an intelligent four-footed animal, capable of making simple arithmetical calculations, and even of ratiocination." Your statement was based on a paper of Dr. Heinroth which appeared in the *Illustrierte Zeitung*.

I believe that it will be of interest to your readers to hear of a few facts which may serve to throw some light on the other side of the question. These facts are taken from the weekly edition of the *Koelnische Volkszeitung* (No. 36, September 8, 1904):

1. A watch was presented to "clever Hans." *Without condescending to look at it*, he immediately gave the correct answer by stamping eleven times—it happened to be 11 o'clock. I repeat, the animal did not even glance at the watch.

2. Mr. X, who was among the spectators, wrote an example of arithmetic on a slip of paper in such a way that no one present, not even the owner of the horse, knew the figures of the problem. The paper was then presented to the horse with the request to paw the solution. The animal started pawing *ad infinitum*. Mr. X exclaimed: "It's all wrong; the horse has passed the number by far." Whereupon the owner replied in an angry tone: "Why, of course; you must tell when the required number has been reached, or else you might as well ask the horse to sit down in a cab and take a ride!" There followed an excited scene, and "clever Hans" was led back to his stable.

3. On a certain wall near by, fourteen boys were sitting in two rows. Hans was asked by Mr. Schillings how many boys were sitting on the wall. *Without really looking in the direction of the wall and counting*, Hans pawed fourteen times.

4. Another time, a captain of the army gave Hans a very simple problem in addition, but made sure that his owner could not influence the horse. Hans failed completely. Then the owner got hold of him, and lo! Hans solved the problem correctly. (*Koeln. Volksz. No. 36, p. 5.*)

It is curious to note, moreover, that Hans must always paw the answers to the questions put to him. Take the following case. A picture is shown to Hans, representing one of the people before him. All present form a row and Hans is requested to point out the person represented. Now, why does Hans not simply walk up to the person in question? Why must he paw the answer?

Again, is it not strange that during the calculations Von Osten must feed the horse with carrots, if he would have him work. If Hans be intelligent, why should the honor of being admired by thousands of people and of being far above the common level of horses not, occasionally at least, be sufficient inducement for Hans to display his cleverness? Certainly, children of from twelve to fourteen years—and Hans is declared by his owner to have attained to the same degree of education as these—readily act from motives of ambition.

Besides, although Hans seems to have given correct answers in the absence of his owner, it is by no means certain that his owner is the only person who had a hand in, or at least is privy to Hans's training. Perhaps Mr. Schillings could furnish us with an explanation.

Finally, it is noteworthy that the Sixth International Congress of Zoologists, held at Bern on August 15 to 19, was requested by Mr. Schillings to investigate the matter. *A hearty laugh* was the answer of the learned men. They did not even call upon Dr. Heck and Prof. Matschie, who had been recommended by Mr. Schillings to report on the "reasoning horse," and some of them were impolite enough to relegate the circular submitted to them to the waste basket.

Such are some of the facts, dear Mr. Editor, which rather seem to justify those who, to quote your own words, "skeptically assert that his (the horse's) intelligence is simply the result of ingeniously concealed trickery on the part of his trainers."

H. MUCKERMANN, S. J.

Sacred Heart College, Prairie du Chien, Wis., October 23, 1904.

An automatic gas pump has recently been exhibited, constructed upon a plan enabling it, when set in operation, to run automatically, and to produce as perfect a Torricellian vacuum as is possible. It has been devised to provide a comparatively portable machine, suitable to special laboratory work, and for researches requiring prolonged pumping. A Röntgen ray bulb of a capacity of 200 cubic centimeters can be exhausted in thirty minutes.

Electrical Notes.

Some very interesting experiments have recently been made by an electrical firm at Geneva, in using continuous current at 70,000 volts for the transmission of power over the constantly increasing distances which are necessary for industrial purposes. The tests were made principally for the purpose of determining to what degree insulation will serve with continuous, as compared with alternating, current.

An improved electric relay has just been developed by Dr. Lee de Forest, which may be used in connection with an electrolytic wireless receiver to operate a sounder of the usual Morse telegraph type. Telegraph sounders have long been operated in relay with the coherer type of receivers, but heretofore all attempts at constructing a relay which would operate a sounder under control of the delicate electrolytic receiver have proved failures, and it has been necessary to use a telephone receiver in the relay circuit for detecting the wireless signals.

Our French contemporary *L'Eclairage Electrique* states that Bilbao is to be supplied with electric energy from three power stations situated at Quintana Martingalindez, Puentezana, and San Sebastian. At present the Quintana Martingalindez station is equipped with four 1,000-horse-power sets, consisting of a water turbine directly coupled to a three-phase generator. At a speed of 375 revolutions per minute the current is produced at 3,000 volts. The voltage is then raised to 30,000 volts, at which pressure the energy is transmitted to Bilbao, a distance of 50 miles.

The rapid growth of the American Institute of Electrical Engineers has been pointed out as an indication of the spread of the electrical industry. From a membership of about 1,250 in 1901, it has jumped to one of over 3,000 at the present time. These figures include all the different grades of membership, and the highest figures represent the lowest grade of membership, for which no technical examination is required. The American Institute of Electrical Engineers was organized in 1885, but the greatest accessions to the roll have been within the past few years. A very similar condition of affairs, although not so marked, is manifest in the other somewhat allied bodies, the American Institute of Mining Engineers, the American Society of Civil Engineers, and American Society of Mechanical Engineers.

Many are the efforts which have been made to separate the emulsified oil from the condensed feed water supplied to boilers, and it is doubtful if the result has ever been accomplished in a thoroughly practical and satisfactory manner until recently, when a process of doing this by the means of the electrical current was discovered. The ordinary means of performing this operation have proven inadequate, for the reason that the emulsified particles of oil are so exceedingly minute that they will pass through any filtering medium. There are chemical means of bringing about this result, but it is said that they are all open to objection. The electrical process referred to is known as the Davies-Perrett process, and in this the oily water is allowed to run over and under plates of iron which are placed vertically in a wooden tank. The plates are connected alternately to the positive and negative poles of a dynamo or battery, so the current passes from one plate to another through the flowing water. After this treatment the oil and water, which have entered the tank at one end as a milky liquid, pass out the other end with the emulsified oil coagulated completely. The water is then passed through wood wool, and then through a sand and sawdust filter, after which the water is beautifully clear, and it is stated that an analysis fails to show any indication of the oil. Such a plant, with a capacity of treating 3,500 gallons of water per hour, is now in constant use at an establishment in Tottenham, England, and is said to be performing its duties in a very satisfactory manner. In this case the treatment tank is 12 feet long by 2 feet deep and 2½ feet wide. The two filters take up less room than this.

Some remarkable results have been achieved with the Williams & Daft electrical ore-finder, which was fully described in the pages of the SCIENTIFIC AMERICAN a short time ago, by the discovery of valuable and extensive hematite ore deposits in the vicinity of Barrow in the northeast of England. For some time the output of hematite round Barrow has been seriously declining. In the case of one company the output has decreased from 16,000 tons a week to 2,000 tons, and it was feared that the deposits were exhausted. Repeated efforts have been made, in the hope of discovering new veins of ore, but without success, and as a final resource the electrical ore-finder was requisitioned by the Barrow Hematite and Steel Company. Owing to the fact that the conductivity of hematite is extremely slight, not much greater in fact than the conductivity of the ground itself, it was necessary to use specially-tuned instruments. A certain area was allotted for the purposes of the test. The ore-finder had not been long in use before it indi-

cated the presence of hematite in large quantities. The Barrow Company decided to prove the accuracy of the divination, and boring operations at the points marked were commenced. Before the work had proceeded very far, the hematite deposit was encountered. A little deeper the hematite gave way to limestone; but contrary to the prevailing practice of abandoning boring when the limestone deposit was reached, owing to the theory that hematite did not exist below it, boring was continued in accordance with the findings of the ore-diviner. Finally, at a depth of 88 feet, which was approximately the depth indicated by the instrument, extensive deposits of the hematite were found. The vein struck is estimated to represent some 2,000,000 tons. Further divining operations are to be carried out, to ascertain the existence of other unknown layers in the vicinity. A new era of prosperity for Barrow is now realized, as illimitable quantities of the ore are to be obtained practically at the doors of the furnaces. Other valuable ore veins have been discovered by means of variously-tuned apparatus. New rich deposits of lead were indicated in Wales, and copper in Cornwall. It is also being used in Australia for prospecting gold, while special instruments have been sent to Mexico for the purpose of divining gold, silver, copper, and other mineral deposits.

Engineering Notes.

A deputation from the Paris Municipal Council left for Germany recently. In the course of the visit the delegates are to inspect the methods adopted for supplying water to Berlin, Hamburg, Frankfurt, and several other large towns.

It is announced that the French government arsenals are now engaged in changing the sights of the Lebel rifle, in order to permit of the employment of a new bullet which will considerably increase the range of the weapon. Each arsenal can transform 300 rifles a day.

A great convenience for the draughtsman, which has recently been put before the public by an English firm, is a transparent drawing board, the feature of which is a plate of glass, one-quarter of an inch thick, which is sunk into a wooden frame so the edges of the wood and glass are quite flush with each other. Convenient bars are arranged across the apparatus, on which the originals to be worked over are fastened, and there is also a rest for the forearm of the draughtsman while at work. The board may be tilted at any desirable angle, and held at the proper point by two props, which fold up into the frame of the device when it is desired to pack it away. A mirror is swung under the glass, which can also be fixed at any suitable angle, and the light reflected by this can be made to strike under the work, and the task of copying a drawing thus made quite easy. Where there is a lack of light, the illumination may be supplied by means of a row of electric lights fitted along the edge of the board. The apparatus folds flat and is very portable.

It is claimed that the underground railroad of the city of Chicago will in a great measure relieve the congested condition of the streets of that city, not so much by the diversion of traffic below the surface, but by the removal of the great number of teams heretofore required to handle the freight traffic of the great western metropolis. The first instance of this kind has just been accomplished in an experimental manner by the transportation of the mails by this sub-surface line instead of by horses, conveying the bags across the city from one depot to another. The entire transcontinental mail had to be transported in this manner, and much delay resulted incident to the exchange from the trains to the wagons and back again, independent of that which frequently happened to the wagons in the course of their trips through the thronged streets of the busy city. Connection has been established between the stations of the Lake Shore and Michigan Central and the Chicago, Milwaukee & St. Paul, and upon the completion of the work, the mails were transferred directly to the tunnel cars, and after being sealed were sent on their way. Their operation is largely automatic, and as the way is clear, no time is lost in transit. The company undertaking the contract agrees to cut the present time of handling the mail between the points named in half, but at the same time the officials are confident of their ability to do very much better than this. If the scheme proves successful, other connections will be made, and the mail to and from the main post office handled in this manner. This innovation, besides cutting down the time of mail transportation, will be the means of saving much money now spent by the government in the maintenance of wagons and horses. It will also place at the disposal of the Chicago postmaster considerable room about the post office structure, which is now given up to the purposes of a wagon stand. This is an item of some importance in this case, as there is a scarcity of room, and the space thus gained can be put to good use.