THE CAMEL CORPS OF THE BRITISH ARMY.

Among the curious features of the British military expedition which is now slowly proceeding up the river Nile, for the relief of Gordon at Khartoum, is a camel corps. It is composed of several thousands of ungainly camels, each carrying a trooper. This body of men and stalking animals is said to present an extraordinary spectacle, especially when in motion.

Our illustration herewith, which we take from the *Graphic*, will give a good idea of how this unique division of cavalry service is equipped. The uniform consists of a red flannel tunic, corduroy knee breeches, and serge leggings, with white pith helmet covered by white cloth. The accouterments are heavy, and include a rolled cloak on the right shoulder, a leather cartridge belt on the left shoulder, a tin mess trap, a water bottle, a brown leather ammunition bandoleer, with fifty rounds of ammunition, and a rifle pocket in which the butt of the rifle is supported. The arms are the Martini-Henry rifle and bayonet, instead of the ordinary cavalry carbine. Each camel also carries the second half of a tent, with pole and guides, besides three days' provisions and water for his master, and food for himself.

These tents afford cover for two men each; a waterproof sheet forms the floor, and on the pole of the tent hangs a leathern water bottle with filtered water, while outside on a tripod is slung a skin containing well or Nile water for ordinary purposes. One end of the tent is closed by a laced curtain, which can be shifted to either end for protection against sand storms.

A good load for a camel is about 600 pounds, though for short journeys it can carry 1,000 pounds; its speed is seldom more than three miles an hour, and the swiftest dromedaries do not exceed ten; but the former rate of travel can be kept up for twenty hours without rest. The hump upon its back affords practically a storehouse for food, as it is slowly reabsorbed during long marches. Its first stomach or pouch has a division (which may be closed by muscular action whose walls are provided with a system of large cells, capable of considerable distention, which the animal can fill with several quarts of water, and thus carry with itself a supply for its own wants for about a week, a supply which it occasionally yields with its life to save that of its master. Its strength, power of endurance, ability to subsist on the coarsest food, to go without water, and to travel over the yielding sand, have earned for it the title of the "ship of the desert." The justness of this cognomen is strongly attested by the British soldiers, one of whom writes that he never felt "more at sea" than when first taking a camel ride, the motion producing such sensations as most people feel at sea in rough weather, the peculiar swinging and jerking gait jolting up the uninitiated in a way anything but pleasant.

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The height of the Arabian camel at the shoulder is between six and seven feet, and the color of the rather coarse hair is of various shades of brown. The first attempt to mount one calls for no little dexterity, as the usual mode is to bestride the animal while he is on his knees, and it is no easy matter for a a novice to maintain the correct "center of gravity" when the animal rises. The British soldiers, however, seem to have entered this novel service with considerable enthusiasm, and have been disposed to make pets of their new companions, although they report that thus far it seems to be a most "unsocial beast."

Cheap Gas in Pittsburg.

The Philadelphia Company (Westinghouse), which has entered Pittsburg with its big 10 inch line, has fixed the price at 15 cents, and it is stated that in consequence thereof it is almost overwhelmed with orders from householders and others.

The Drying of Timber.

Some twenty years ago, the firm of John Stephenson and Co., of New York, who were then as now engaged in the building of street cars, had an experience in the drying of timber some of the details of which, says the *National Car-Builder*, may be of interest to our readers, and especially to car builders.

During the early part of the war, the concern was engaged almost exclusively in the manufacture of gun carriages, limbers, etc., for the government. For this purpose it was necessary to have dry oak timber of the best description, a large stock of which was usually kept on hand by the government for this kind of work. This was necessary, because the thickness required was some nine inches, and it was out of the question to obtain the dimensions in the open market. The government supply, owing to the excessive demand, was exhausted in a very short time. The large size of the sticks made it out of the question to think of seasoning it in the ordinary way, and no dry stock was available. The proposition to use the timber in a green state was not entertained for a moment by the officers in charge, and hence it became necessary to devise some method of seasoning that should be quick, and an apparatus which should be able to handle a considerable quantity of it in a short time. The plan which was suggested was the application of dry steam in direct contact with the wood. Furnaces were at once erected, and preparations made for the work. When the lumber first came from the furnaces, it was as bright and handsome as could be desired. The external surface was perfect. The seasoning, however, had evidently gone on in a way very different from that of ordinary air dried lumber. Pieces which were rectangular in section became to a certain extent hour-glass shape, measuring less in diameter at the center, on the sides, than at the corners. Air-dried timber, on the contrary, measured more at the centers than at the corners, the surfaces being all convex instead of concave, as was found to be the case with the steam-dried timber. This showed that the drying had taken place from the center. The steam was used at a pressure of 250 pounds per square inch. On opening the sticks, the timber was found to have been completely ruined. The whole interior had been practically converted into charcoal, so that it could be crumbled in the fingers, and was of a brownish-black color. Even so small a stick as an army wagon spoke would have its center portion so destroyed as to leave cracks of an eighth of an inch running through it, while the surface exposed to the direct contact of the steam was apparently bright and sound. This, of course, put an end to all attempts to dry the oak by the use of high pressure steam, and they finally adopted a heat of about 150° Fah., as a maximum. With this they were enabled in three or four days to remove 400 pounds of water from a ton of green oak.

An idea has been generally prevalent that lumber dried by artificial heat loses something of its strength by the process. Just what this loss is, or how it affected the lumber, is not so generally known. The experiment detailed, however, shows that it is a carbonizing process, which can go on at low temperatures, and this harmonizes completely with Count Rumford's experiments. He succeeded in completely charring thin shavings of beechwood with a temperature, we believe, below 212 degrees. We have seen portions of the pine finish of the Hudson River steamer Drew which had been charred, and seemed to be on the point of ignition, by the heat of the steam heating pipes from the boiler. As this vessel carries not over 30 pounds of steam, the temperature must have been less than 251 degrees.

In Mr. Stephenson's establishment at the present time, the practice is to thoroughly air-dry all lumber used, and then, after the stuff has been worked nearly to its finished form, it is placed a short time in a drying room heated to 150°, where the surface moisture which it may have acquired is removed, and drying is carried beyond the point to which it can be carried by atmospheric influences alone. This is also the practice in the best wheel making establishments, the object being to dry the wood when it is put together beyond the point which can be reached by air drying.

Water Pyrometer.

Messrs. Carnelley and Burton have recently described a simple form of pyrometer, not scientifically accurate, but well suited for use in technical operations, and especially so for determining the temperature of hot gases in flues, etc. A coil of copper tubing comprising about five turns is exposed in the flue or other place where the temperature is to be ascertained. It is supplied with water under a constant head or pressure, so as to maintain a regular flow through the coil. Thermometers are fixed to enable the incoming and outcoming temperature of the water to be ascertained. To rate these indications, a series of experiments must first be tried; a number of known temperatures being obtained by using metallic alloys having a known fusing point, or in any other way. From these a table is constructed (which only applies to the particular circumstances under which the instrument is fixed), enabling the observer to tell, by the increase of heat gained by the water in flowing through the coil, the actual temperature. The principle of the instrument consists in the fact that, for any definite temperature to which the coil is exposed, a certain definite increase of heat will be taken up by the water.

Heat Conductivity of Soils.

The author's conclusions are that the heat conductivity of a soil is so much the greater the more densely its particles are packed together. The difference thus occasioned is the more considerable the higher the proportion of water. In a dry soil the heat conduction rises with an increase in the size of the particles of the soil. Water increases the conductivity of the soil considerably, the more the larger its proportion in the soil, other circumstances being equal.—*Dr. F. Wagner.*

Soluble Glass.

Although the manufacture of soluble glass does not strictly belong to the glassmaker's art, says the *Pottery and Glassware Reporter*, yet it is an allied process to that of manufacturing glass. Of late soluble glass has been used with good effect as a preservative coating for stones, a fireproofing solution for wood and textile fabrics. Very thin gauze dipped in a solution of silicate of potash diluted with water, and dried, burns without flame, blackens, and carbonizes as if it were heated in a retort without contact of air. As a fireproofing material it would be excellent were it not that the alkaline reaction of this glass very often changes the coloring matters of paintings and textile fabrics. Since soluble glass always remains somewhat deliquescent, even though the fabrics may have been thoroughly dried, the moisture of the atmosphere is attracted; and the goods remain damp. This is the reason why its use has been abandoned for preserving theater decorations and wearing apparel. Another application of soluble glass has been made by surgeons for forming a protecting coat of silicate around broken limbs as a substitute for plaster, starch, or dextrine.

The only use where soluble glass has met with success is in the preservation of porous stones, building materials, paintings in distemper, and painting on glass. Before we describe these applications we will give the processes used in making soluble glass.

The following ingredients are heated in a reverberatory furnace until fusion becomes quieted: 1,260 pounds white sand, 660 pounds potash of 78°. This will produce 1,690 pounds of transparent, homogeneous glass, with a slight tinge of amber. This glass is but little soluble, even in hot water. To dissolve it the broken fragments are introduced into an iron digester charged with a sufficient quantity of water at a high pressure to make a solution marking 33° to 35° Baume. Distilled or rain water should be used, as the calcarcous salts contained in ordinary water would produce insoluble salts of lime, which would render the solution turbid and opalescent; this solution contains silica and potash combined together in the proportion of 70 to 30.

Silicate of soda is made with 180 parts of sand, 100 parts carbonate of soda (0·91), and is to be melted in the same manner as indicated previously.

Soluble glass may also be prepared by the following method: A mixture of sand with a solution of caustic potash or soda is introduced into an iron boiler, under 5 or 6 atmospheres of pressure, and heated for a few hours. The iron boiler contains an agitator, which is occasionally operated during the melting. The liquid is allowed to cool until it reaches 212°, and is drawn out after it has been allowed to clear by settling; it is then concentrated until it reaches a density of 1·25, or it may be evaporated to dryness in an iron kettle. The metal is not affected by alkaline liquors.

This glass is soluble in boiling water; cold water dissolves but little of it. The solution is decomposed by all acids, even by carbonic acid. Soluble glass is apparently coagulated by the addition of an alkaline salt; mixed with powdered matters upon which alkalies have no effect it becomes sticky and agglutinative, a sort of mineral glue.

To apply soluble glass for the preservation of buildings and monuments of porous materials, take a solution of silicate of potash of 35° Baume, dilute it with twice its weight of water, paint with a brush or inject with a pump; give several coats. Experience has shown that three coats applied on three successive days are sufficient to preserve the materials indefinitely, at a cost of about 15 cents per square yard. When applied upon old materials, it is necessary to wash them thoroughly with water. The degree of concentration of the solutions to be used varies with the materials. For hard stones, such as sand and freestones, rock, etc., the solution should mark 7° to 9° Baume; for soft stones with coarse grit, 5° to 7°; for calcareous stones of soft texture, 6° to 7°. The last coating should always be applied with a more dilute solution of 3° to 4° only.

Authorities are divided upon the successful results of the preservation of stone by silicates. Some claim in the affirmative, that the protection is permanent, while others assert that with time and the humidity of the atmosphere the beneficial effects gradually disappear.

Soluble glass has also been used in Germany to a great extent for mural painting, known as stereochromy. The process consists in first laying a ground with a lime mortar; when this is thoroughly dry, it is soaked with a solution of silicate of soda. When this has completely solidified, the upper coating is applied to the thickness of about one-sixteenth of an inch, and should be put on very evenly. It is then rubbed with fine sandstone to roughen the surface. When thoroughly dry, the colors are applied with water, the wall is also frequently sprinkled with water. The colors are now set by using a mixture of silicate of potash completely saturated with silica, with a basic silicate of soda (a flint liquor with soda base, obtained by melting 2 parts sand with 3 parts of carbonate of soda). As the colors applied do not stand the action of the brush, the soluble glass is projected against the wall by means of a spray. After a few days the wall should be washed with alcohol to remove the dust and alkali liberated.

The colors used for this style of painting are zinc white, green oxide of chrome, cobalt green, chromate of lead, colcothar, ochers, and ultramarine.

Soluble glass has also been used in the manufacture of soaps made with palm and cocoanut oil; this body renders them more alkaline and harder.

Interesting experiments have been made with soluble glass for coloring corals and shells. By plunging silicated shells into hot solutions of salts of chrome, nickel, cobalt, or copper, beautiful dyes in yellow, green, and blue are produced. Here seems to be a field for further applications of this discovery.

Soluble glass has also been applied to painting on glass in imitation of glass staining. By using sulphate of baryta, ultramarine, oxide of chrome, etc., mixed with silicate of potash, fast colors are obtained similar to the semi-transparent colors of painted windows. By this means a variety of cheap painted glass may be made. Should these colors be fired in a furnace, enameled surfaces would be produced. As a substitute for albumen for fixing colors in calico printing, soluble glass has been used with a certain degree of success; also as a sizing for threads previous to weaving textile fabrics. Thus it would seem that this substance has been used for many purposes, but since its application does not seem to have been extended to any great degree, the defects here pointed out in its use as a fireproofing material perhaps also exist, to a certain degree, in its other applications. In painting upon glass, for instance, it is asserted that the brilliancy and finish of ordinary vitrified colors cannot be obtained.

Our Naval Torpedo Service.

The report of the Naval Bureau of Ordnance briefly refers to the work of Captain T. O. Selfridge, who was relieved on the 1st of November from the charge of the Torpedo Station at Newport. Under the administration of Captain Selfridge, as we have before stated, a complete system of gun cotton ship and boat torpedoes has been perfected under the direction of the Bureau of Ordnance. And, as the report shows, the manufacture of gun cotton, the first of the kind in this country, has been successfully initiated. Instead of two classes of torpedoes for ships and boats, but one is now used, carrying the same charge (31½ pounds) of gun cotton, equivalent to 125 pounds of powder. While the explosive effect has been increased, the weight of the charged torpedo has been reduced from 380 pounds to about 75 pounds. Gunpowder differs from nitro-glycerine and its various compounds, known under the name of dynamite, hercules, giant, atlas, and other powders, as also gun cotton, in not exploding instantaneously, but simultaneously. That is, the whole mass is not ignited at once, and consequently to obtain the maximum effect from gunpowder it must be inclosed in a very strong and therefore heavy case.

On the other hand, gun cotton has at least four times the explosive effect of gunpower, weight for weight, and is so violent and instantaneous in its action as to need no retaining case beyond the incompressibility of the water which surrounds it when immersed. Experiments at the Torpedo Station would tend to conclusively prove this, as well that a maximum saturation of the gun cotton does not affect its explosive condition. In these experiments disks of gun cotton were stowed in a canvas bag around the dry gun cotton detonator, exposed under water for two hours or more, and then exploded with apparently the normal force.

Gunpowder will not explode when wet, requiring, therefore, a perfectly water tight case, while gun cotton is believed to destroy more strongly when moderately wet than when dry. This is for the reason that the interstices in the cotton are then filled with an incompressible fluid, instead of an elastic medium, a condition more favorable to the chemical charge of the molecular construction of the gun cotton. Gunpowder explodes immediately when exposed to flame in a moderately confined state, such as a ship's magazine, while wet gun cotton will not explode if exposed to flame or red hot iron. For these reasons gunpowder is preferable for artillery, in producing less strain upon the walls of the gun, while gun cotton, by its greater explosive power, is preferable for torpedo service, and by it greater factor of safety, superior to all other known high explosives for storage on shipboard. The great weight of the gunpowder torpedo makes it inconvenient and clumsy to handle, and difficult to quickly manipulate, and as issued could only be fired at will.

The destructive range of an ordinary torpedo against a strong target, such as the sides of the modern man-of-war, is very small, probably not more than six feet. It is, therefore, readily understood, when exposed to the hazard of a torpedo attack, an operator might well suppose his torpedo had exploded close to the object and yet outside of its destructive range. Hence, the only sure method is to employ a torpedo that will explode by contact; for then it is assured that the torpedo, by its explosion, has exerted its greatest possible effect; and probably none others will be employed in a real torpedo attack.

The gun cotton torpedoes now issued from the Torpedo Station comprise both service and contact. They contain about the same charge, viz., 31½ pounds, and are alike in all respects, except the primer case of the latter contains a circuit breaker, closed only on contact.

The gun cotton, however, is stored in metal cylinders, instead of being directly packed in the torpedo can, exposing it to disintegration, making it in mass more difficult to ascertain its condition, and requiring a heavier case and more time to prepare it for service. These cylinders containing six disks, of 4½ pounds, are labeled with their gross weight; and water may be added to supply a loss of moisture through a small filling hole in each.

The "service" case resembles a drum, of light sheet iron, with two thin malleable iron beads, the top one movable. When needed for service, the top is taken off, its charge of six cylinders dropped into their places, leaving an annular space in the center, of about 3¾ inches diameter. Into this is placed the primer case, containing only dry gun cotton equal in amount to about one-third the charge of wet. The dry is exploded by a mineral fulminate detonator inclosed in it, which also contains the electric fuse bridge. The wires from the latter pass through a water cap in the cover of the primer case, and the latter must be absolutely water tight. This precaution must be closely observed, for the fulminate cannot be depended upon to explode the cotton if wet.

The torpedo holder is a light tripod uniting into a single piece called the knob. The case is easily and strongly held by the three legs, and the knob fits into the end of the spar from which it is fired. The contact torpedo case has arms projecting from the outside of the bottom cover, which are connected with the interior of the primer case, in which is the circuit breaker. When any one of these arms are struck it will, by an ingenious contrivance, close this break, and if the firing battery is connected in the circuit, the torpedo will immediately explode.

A single wire only is employed when the torpedo is to be fired on contact, but a second is also connected to the torpedo, but not to the battery. Should it become desirable to explode the torpedo without waiting for contact, this second wire is attached to the other pole of the battery. The arrangement is such that in this case the circuit breaker is cut out, a complete electrical circuit is established, and the torpedo fired "at will."

Until recently the usual method of exploding boat torpedoes has been from wooden spars. These spars have but one fixed rest, the inner end is secured by a chain, and cocks up in the air when the torpedo is immersed. Consequently the torpedo is often thrown by the pressure of the water head off, or thwart the bows, the angle of immersion is unnecessarily great, large diameter and great water resistance are required for requisite strength, and the spar is frequently broken after one explosion. The steel spars and boat fittings now issued in their place have reduced many of these objections to a minimum.

The spars are in three sections; two of steel and the outer an inexpensive one of wrought iron designed to protect the steel section from injury, and quickly replaced. They are jointed together like a fish rod, making a single length of 41 feet. The steel sections are thin tubes, 4½ and 3½ inches in diameter, and are re-enforced by forcing thin tubes into them, in such a way that the re-enforce fits very closely the outside tube.

The boat fittings consist of a T iron bar across the gunwale close to the stern, to whose ends guide bars are riveted. In these guides, by means of a chain, slide a traveler through which the spar passes some feet aloft, on each gunwale is secured a swivel clutch with top and bottom rollers, in which the spar rests, and which allows the spar to assume any angle, while it is firmly held in position. The spar rests on rollers, and if the traveler is triced up, it can with its torpedo attached be run out its full length and carried in this position above the water till the moment before attack, when, if the tricing chain is let go, the torpedo will at once reach the desired immersion.

The New Steamer Umbria.

The New York *Herald* prints an interview with William Bryce Douglass, constructing engineer for John Elder & Co., Glasgow, who came over in the Umbria's first trip in order to note the working of the engines. He thinks that about 6 days 6 hours is the limit of the Umbria's average speed, and that the limit of single screw engines has been nearly reached, owing to the difficulty of obtaining larger shafts. There is a loss of economy in twin screw engines, and it is never quite possible to get identical results from each engine. The Umbria's engine is the most powerful single marine engine afloat, and indicates 14,500 H.P., or about 1,000 more than the Oregon. Higher steam pressure is carried—110 pounds—and also greater speed, as 70 against 65 revolutions. The screws have the same pitch—33 feet—but differ 3 inches in diameter, the Umbria's screw being the larger, or 24 feet 3 inches.

He thinks the Oregon has done her best in a quick passage in 6½ days, and that the Umbria under favoring circumstances may make it in about six days. He advocates Fox's corrugated furnaces for high steam pressures, admits the utility of twin screws for maneuvering, though unnecessary in Atlantic steamers, criticises the depth of entrance to New York harbor, which deprives the Umbria of 300 to 400 tons carrying capacity, and says that the building of vessels of ordinary type is overdone, that designs for special science are in demand, and the shipbuilding trade is now probably at its lowest ebb. He is now building two engines, one of 3,500 H.P. and one of 1,500 H.P., for the steamships Persia and Batavia, triple expansion, with valve gear of new design, to carry 150 pounds steam, and he expects them to be the most economical ever made to the present day. He advocates well constructed torpedo boats rather than ponderous iron clads for a navy. He says that "marine engine building, although based on strictly scientific methods, is to a large degree an art." In regard to American built steamships, he made in conclusion some very refreshing remarks: "I have seen the latest of them. They are very nice little ships. I think they are very good ships of their kind, but they are very different from ships which are adapted to the Atlantic service. The work is very good, and I could find no fault with the engines."