AN INGENIOUSLY WHITTLED FAN.

On a street corner near City Hall Park in New York city, an industrious old blind man has for years plied a brisk trade in selling the fans which he dexterously whittles from a single piece of wood to the undisguised admiration of the many small boys who gather about him.

The blind man's tools are a jack-knife and a tub of water; his material a piece of soft white pine 12 or 14

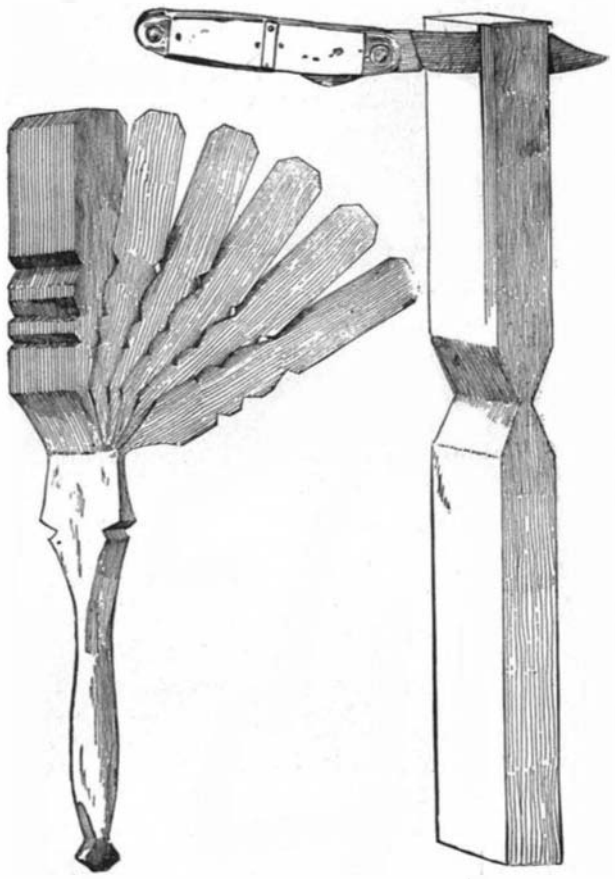


Fig. 1. Fig. 2.

HOW THE FANS ARE MADE.

inches in length, 2 inches in width, and about an inch thick. Notches are made in each side of the piece of wood somewhat above its middle point, a thickness of one-quarter of an inch being left between the notches. The shorter end of the wood is split downward, as indicated in Fig. 2, as far as the notches, into sections about $\frac{1}{16}$ of an inch thick. From twenty-five to thirty-five parts or blades are needed to make a good fan. To form the handle of the fan, the lower, longer portion of the wood is partially sectioned to form small auxiliary fans, or merely thinned down to form a handle. The blades, after having been thus produced, are notched, as shown in Fig. 1. The wood is then thoroughly soaked in a tub of water, and the blades bent to form a fan of the form illustrated in Fig. 3.

ELECTRICAL DREDGE FOR THE VOLGA RIVER, RUSSIA.

In the whole field of civil engineering it would be difficult to find a device which has done more to expedite the construction of works that involve the handling and removal of great masses of material than the powerful suction dredges which are associated with the name of Lindon W. Bates, an American engineer. In a recent issue of the SCIENTIFIC AMERICAN we illustrated the big dredges which are in use by the United States government on the Mississippi River, and of these the "Beta" is credited with a record of between seven hundred and eight thousand cubic yards of material handled in one hour. One of the most recent machines of this class to be constructed is the powerful double dredge that forms the subject of our illustration, which was built for the Russian government dredging operations on the Volga River.

In designing the Volga dredges Mr. Bates introduced several novel features, which were intended to economize time in the maneuvering of the dredges themselves and of the pontoon pipes by which the dredged material is conveyed and discharged. A distinctly novel feature is the use of electric power for these purposes, the movements of the dredges and of the pipes being controlled by twelve separate electric motors, disposed on the dredges themselves and upon the pontoons. In order to allow the dredge to be taken through the canals by which she had to pass from the Baltic to reach the Volga River, the dredge was constructed practically in two halves. Each of the two hulls is constructed of steel and is covered with a 3-inch pine deck, above which is built a deck-house and a pilot-house of light frame composition. At the bow, recesses are formed to accommodate the "suction ladders." A few feet back from the bow, one on each side of the hull, are two triangular recesses, which are cut away to accommodate a pair of screw propellers. Each screw shaft is direct-connected to a 125 horsepower electric motor. The shafts are arranged at an angle of about thirty degrees with the center line of the vessel, and they not only co-operate with the twin propellers at the stern in driving the vessel ahead or astern, but they assist in swinging the dredge to right or left when the operation of dredging is in process. The twin propellers at the stern are also each direct-connected to a 125-horsepower motor. Two 30-horsepower motors are carried on each pontoon line, one of which extends from the stern of each half of the dredge. The four motors on each dredge and the motors on the pontoons are all connected with, and can be controlled from, the pilot-house. The electric current is furnished by a 600-kilowatt generator, directly connected to a fore-and-aft triple-expansion engine, which is clearly shown in our illustration. The engine has cylinders as follows: high pressure, 14¼ inches; intermediate, 22¾ inches; and low pressure, 37⅜ inches diameter, the stroke being 24 inches. At a speed of 200 revolutions per minute the indicated horse power is 800.

Of course, the most important feature in a dredge of this type is the main centrifugal pump, which is located amidship. The runner makes from 150 to 180 revolutions per minute. It is driven by a divided, vertical, triple-expansion engine, one set of cylinders being carried on the starboard and the other set on the port side of the pump, the whole being connected upon one shaft. The high pressure cylinder is 21 inches in diameter; the intermediate, 34 inches; and the low pressure, 39 inches in diameter; the common stroke being 24 inches. The indicated horse power is from 1,425 to 1,600. Steam for the whole steam plant is supplied by eight Babcock & Wilcox boilers, four on each hull. These are fired exclusively with naphtha, which is fed to each boiler by four burners, the spraying of the naphtha being accomplished by a steam jet.

The dredged material is brought up by means of

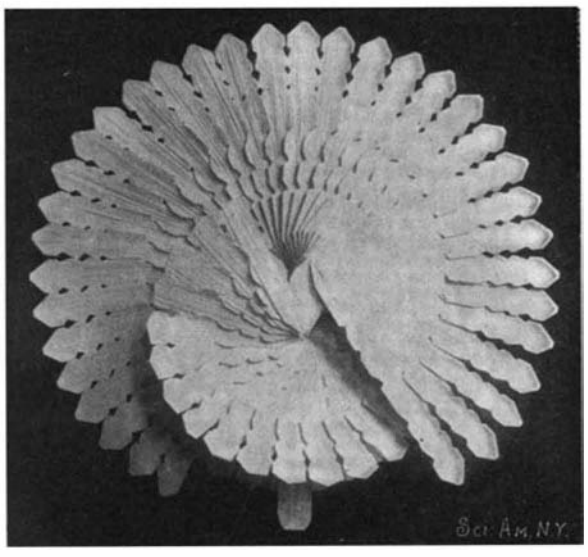
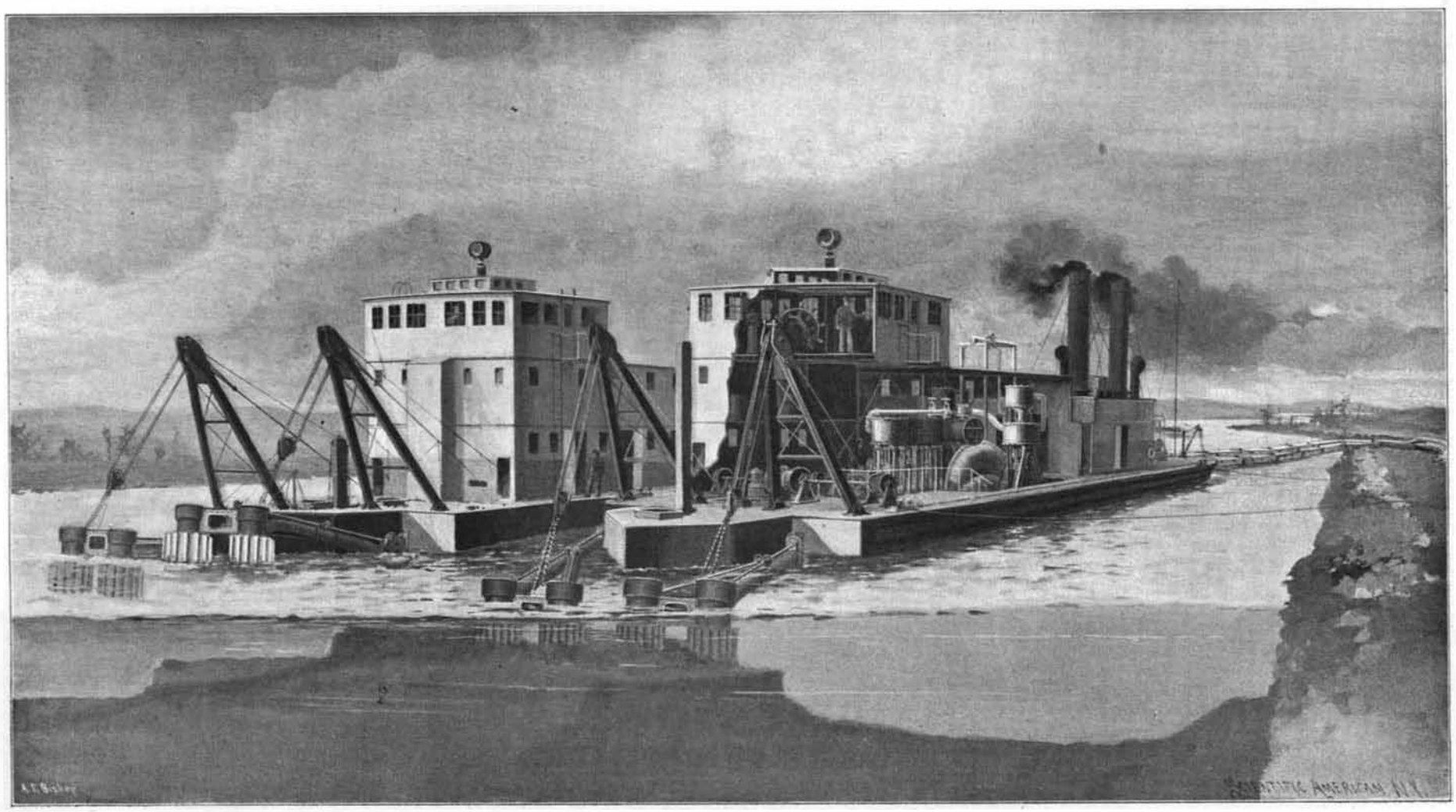


Fig. 3.—A COMPLETED FAN.

four suction pipes, which are attached near the bow of the dredge and hinged upon a common horizontal axis on the dredge. They are raised and lowered by means of derricks, two of which are attached at each bow, and they are capable of dredging to a maximum depth of 16 feet. The lower ends of the four suction pipes on each dredge are inclosed by rotary cutters, which are rotated by means of miter gears and shafting which are attached to the suction pipes and move with them. Each set of shafting is driven by a cutter engine, which is located in the forward part of the hull. It will be seen from our illustration that the suction pipes and cutters form two ladders, supported one on either side of each hull, and approaching each other just in front of the stem of the bow, the four cutters being spaced at equal distances from each other, the width from outside to outside being slightly more than the extreme breadth of the dredge.

Some novel features are embodied in the pontoons, which, with the exception of one at the extreme ends



POWERFUL ELECTRICAL SUCTION DREDGE FOR THE RUSSIAN GOVERNMENT—CAPACITY, 7,000 CUBIC YARDS PER HOUR.

of the respective lines of discharge pipe, are all of similar construction. Each pontoon is 50 feet in length from center to center of its couplings. The cross-section of the pontoons is elliptical, the horizontal axis measuring 9 feet 3 inches, and the vertical axis 3 feet 3 inches. The discharge pipe, which is 33 inches in diameter, is built through the center of the pontoon, the pontoon proper thus forming a sort of elliptical jacket which incloses the pipe.

Accommodations are provided for seventeen officers and men, some above and some below the main deck, and the dredge is provided with a tender in the shape of a stern-wheel steamer, 125 feet in length and 26 feet in beam, which is fitted with comfortable quarters for the officers, and with bunks for ten men, besides all necessary living arrangements. On the main deck is a machine shop which includes a lathe, a drill press and shaper. The dredge is electrically lighted throughout and the pilot-house is provided with a searchlight. Another important feature of the outfit is an oil barge to carry the necessary fuel for the boilers. This barge is 80 feet long by 20 feet beam, and has a total capacity of 130 tons. The dredge was built by the Société Cockerill of Belgium, which is one of the best known iron shipbuilding companies in Europe.

Prior to its departure for St. Petersburg the dredge was given a very thorough trial, with the result that each half of the dredge was officially determined to have a dredging capacity of 3,500 cubic yards per hour, a total for the complete dredge of 7,000 cubic yards per hour. The success of the electrically-driven propellers for maneuvering the dredge was shown in these tests by the fact that, when working on a course where there was a current of from three to four knots per hour, the dredge could be easily maneuvered with but one line ahead under circumstances where, with the ordinary type of dredge, half a dozen lines would have been necessary for anchoring the dredge and swinging it.

Electrical Notes.

The Hamburg-American liner "Augusta Victoria" has been equipped with an automatic telephone pay station, enabling passengers to use local or long distance telephones up to the time of sailing. Just before the lines are cast off, a plug is removed from the back, cutting off the connection. If the scheme is found to work satisfactorily, other steamers of the company will be similarly equipped.

In Buda-Pesth there is a news telephone, and its object is to keep its 6,000 subscribers supplied with all the latest news. The service has a main wire 168 miles in length, and it is connected with private houses and various public resorts. From 7:30 in the morning until 9:30 in the evening, twenty-eight editions of news are spoken into the transmitter by ten men possessing loud clear voices, working in shifts of two. The news is classified and given in accordance with a regular programme, and the service has been eminently successful.

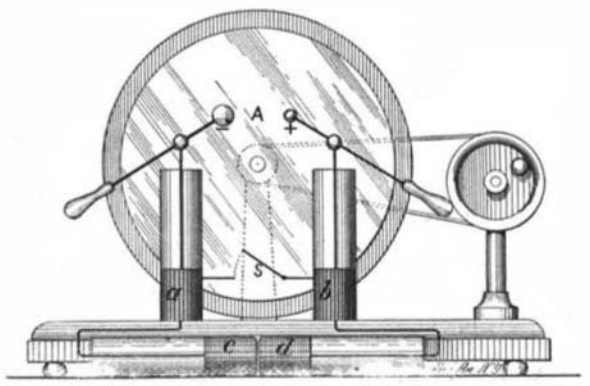
A very ingenious and amusing diversion has been on exhibition at the Crystal Palace in London. This is the Lumiscriptor, or writing by light. It consists of an ingenious contrivance by which portraits or sketches are drawn, and transmitted by electricity on the screen in full view of the spectators. The exact means by which the effect is attained is a secret jealously guarded by the operator, but it appears to be somewhat an application of the pantograph, only in this instance, instead of the picture being drawn upon a larger scale than the original, it is reduced in size. The operator makes his original sketch upon a piece of paper or board about 13 inches square. By means of an electric current this drawing is transferred, line by line, to a small piece of specially prepared blackened surface upon glass, about one inch square, and then projected upon the screen by the limelight in the same manner that photographic slides are projected by the optical lantern. As the artist draws his sketch upon the original board, so it is transferred to the blackened glass, and is projected upon the sheet.

Work is now being carried on in London for the laying of the telephone wires which are to be used in connection with the government scheme of supplying the citizens of the metropolis with an efficient telephone controlled by the Post Office. All the important thoroughfares in the city are torn up, much to the inconvenience and annoyance of the pedestrians and derangement of traffic. The system is to extend from the city to the outlying suburbs, and will cover an area of 640 square miles when completed. It is estimated that the task of laying the wires will occupy at least a year. The work is being pushed forward with all possible speed, and the manufactories of the necessary materials are being maintained at their highest pressure of production. The exchange will be located in Queen Victoria Street, in the building occupied at present by the Post Office Savings Bank. A new home for that department is in course of erection in another part of the city. All the trunk lines, which at present are concentrated at St. Martins le Grand, will be transferred here as soon as the necessary alterations are carried out. The huge switchboards of this exchange will be worked on the central battery or glow-lamp system. The most salient characteristic of this state service is that it will become a powerful rival to the National Telephone Company, which hitherto has had the monopoly. The state proposes to offer a system so cheap that many private houses will be supplied with the telephone. The subscriber can either pay a certain sum annually, which is not to be more than $50—this is exactly half what is at present charged by the private company—or he can subscribe to it on the toll service. In this case the subscriber will pay a small initial sum of about $15, which will practically defray the actual expense incurred by the state for installing the instrument in that particular building, and he will then be charged a toll of two cents every time he rings up the exchange, paying nothing when he is rung up.

ACCELERATION OF THE SPARK DISCHARGE IN STATIC MACHINES.

BY HOWARD B. DAILEY.

One of the inevitable experiments with an influence machine is the exhibition of its spark discharge. As an aid in the production of extra rapid, full length Leyden jar discharges for purposes of display, the spark-multiplying device here described is of great service. In the diagram, *a* and *b* are the usual condensers of a static machine. A switch, *S*, facilitates the convenient connection or disconnection of their outer coatings. Two auxiliary or secondary condensers, *c* and *d*, about equal in size to the primary ones, have their inner coats connected, as shown, with the outer coats of the primary jars, the outside coatings of the secondary jars being in contact or joined by a switch similar to *S*. If *S* be opened while the machine is in operation, the free exchange of electricities ordinarily taking place between the outer coatings of *a* and *b* during their charging and discharging process is interfered with to some extent by the interposition within the extra or shunt circuit of the jars, *c*



SPARK MULTIPLIER FOR STATIC MACHINE.

and *d*, which experience a certain degree of electrification at each spark occurring across the air gap at *A*.*

The effect of this action upon the primary condensers is to prevent their complete discharge, thus leaving them partially filled after the passage of each spark, and therefore in condition to have their striking potential re-established much sooner than would be the case after full discharge. Experiment shows that with a given length of spark at *A*, the succession of flashes becomes more than twice as rapid when *s* is opened; though of course the density of the sparks is proportionately reduced. The mild induced currents passing between the outer coats of *c* and *d* during the display at *A* are of a character peculiarly desirable for a certain class of experiments requiring small volume with comparatively high frequency, such as the illumination of Geissler tubes, physiological effects, etc. If *S* be left open and the outer coatings of the secondary jars disconnected, the discharge becomes a beautiful mixture of brush and sparks; but the sparks, now extremely thin and in enormous numbers, lose their bright bluish appearance and become a dull red. The device is of especial value with the sectorless Wimshurst. As is well known, such machines exhibit much higher efficiency than those with sectors. They possess, however, one serious defect, viz, in order to have any large percentage of their full power realized, considerable resistance is necessary in the air gap; so that while with a long working spark the sectorless machine is greatly superior to its sectored prototype, with the short gap necessary for very rapid condenser discharges its potential suffers serious diminution, which in many cases may even terminate in total extinguishment of electrical action. The double condenser device overcomes this difficulty by enabling the operator to obtain the desired rapidity of discharge with the use of long sparks, and consequently sufficient resistance at *A* to keep up the normal potential of the plates. This interesting arrangement is due to Mr. Edwin Palmer, of Battle Creek, Mich.

*To obtain the longest discharges with certainty and regularity, the negative ball at the spark gap should be about five times the size of the positive. Mention of this very important fact is neglected in many otherwise excellent descriptions of static machines.

Engineering Notes.

The calorific value of the average London domestic refuse has been estimated at about 0·99 pound of water from and at 212° Fah. per pound of refuse burnt. It is calculated that the total amount of power per annum which could be obtained from the whole of the refuse in London if burned in suitable furnaces would amount to 133,000,000 brake horse power hours.

At the Silver Works Company, of Antwerp, has recently been completed an immense chimney shaft 410 feet in height. The interior diameter of the structure at the base is 25 feet, tapering to 11 feet at the summit. This chimney, however, is not the tallest stack in the world, inasmuch as it is not so tall as the celebrated Townsend stack at Glasgow, which towers 468 feet into the air.

The tramp question in the United States has been a most serious one ever since the introduction of railroads. It is estimated that no less than 10,000 are carried nightly on trains, and that 10,000 more are waiting to steal a ride at the same time. The Pennsylvania Railroad has taken a firm stand in the matter, and has equipped a special police force for the purpose of preventing trespassing. Some of the farmers, however, do not approve of this action, as they obtain much of their extra help in harvest times from the drifting population.

Owing to changes in the railway line several villages in South Dakota have been cut off from the railroad. The result is that the villages have moved to the new location. In the towns of Bloomington, Edgerton, Old Platte, Castalia, and Old Selby one building after another was put on skids and towed across the prairie by means of horses and thrasher engines, says The Railway Review, and in one instance a structure 40 by 300 feet was moved three miles, while its contents of merchandise were not disturbed, and trade was being carried on all the time.

An interesting record of the number of locomotives upon twenty of the principal railways in England has just been compiled, and it gives a very good idea of the progress of locomotive building and the development of the railroads in Great Britain. There are in all 16,451 locomotives in operation upon these railways, which is an increase of 277 upon the contemporaneous returns of 1899. The railroads possessing the greatest number of engines are the Midland, 2,597; the London and North-Western, 2,464; and the North-Eastern, 2,083. Three other leading railways each possess over 1,000 engines.

The British War Office is carrying out some experiments with the new patent boot that has been invented by Capt. Loderer, of the Austro-Hungarian army. This device consists of a leather sole, under the heel of which is a contrivance of metal with a long spiral spring inside. The patent is so simple that it can be readily attached to the ordinary boot. The object of the spring is to obviate any jar when placing the foot on the ground, so that it is like putting the foot upon a cushion. Besides this advantage, it also acts as a pleasant ventilator to the foot. The boot has been submitted to prolonged experiments in the Austro-Hungarian army, with distinct success. It renders walking easier, considerably reduces the fatigue of marching, while soreness of the feet is entirely prevented. Before introducing it into the army, the British authorities are testing it among the postmen, who have to tramp long distances in the performance of their duties over hard streets, which is particularly tiring work. If the boots prove successful in this case, they will be distributed among the troops, by whom they will be welcomed, since the present regulation boot is not conducive to comfort or ease during a long march.

The shipbuilding industry of the Clyde, which during the last few months has been very quiet, owing to the war, is now receiving a decided stimulus. Several of the large firms have received orders which will tax their highest pressure of working for several months to come. The Clyde Shipbuilding and Engineering Company has received orders for two steamers of ordinary dimensions, five sets of engines for vessels now in course of erection in their own yards, and several orders for sets of triple expansion engines. Indeed, they have such an abundance of work in hand that they are not at present in a position to entertain fresh orders. Three other well-known firms are also blocked with work, while Messrs. Russell & Company, who have always their capacity of thirteen keel stocks, equal to 70,000 tons, in full swing, are refusing work. Fortunately, very few orders are for immediate delivery. The shipbuilders are experiencing great difficulty in obtaining the necessary materials, and this deficiency is hindering their output to a very great extent. If the supply of material were greater, or at least equal to the demand, work would be hastened considerably. The orders for vessels show no sign of abating, and the Clyde has consequently assumed its former scenes of great activity, which must continue for several months to come.