observers, an equal number being transmitted and received at either end. The local time of sending a signal from one place being known and the local time of its reception being noted, the difference is the meridian distance. The retardation due to the time occupied by the current in travelling along the wire is elimin­ated by sending signals in both directions. The relative personal equation of the observers at either end, both in their observa­tions for time, and also in receiving and transmitting signals, is eliminated by changing ends and repeating the operations. If this is impracticable, the personal equations should be deter­mined and applied to the results. Chronometers keeping solar time at one end of the wire, and sidereal time at the other end, materially increase the accuracy with which signals can be exchanged, for the same reason that comparisons between sidereal clocks at an observatory are made through the medium of a solar clock. Time by means of the sextant can be so readily obtained, and within such small limits of error, by skilled observers, that in hydrographic surveys it is usually employed; but if transit instruments are available, and sufficient time can be devoted to erecting them properly, the value of the work is greatly enhanced in high latitudes.

True bearings are obtained on shore by observing with theo­dolite the horizontal angle between the object selected as the zero and the sun, taking the latter in each quadrant as defined by the cross-wires of the telescope. The altitude may be read on the vertical arc of the theo­dolite; except in high latitudes, where a second observer with sextant and artificial horizon are necessary, unless the pre­cise errors of the chronometers are known, when the time can be obtained by carrying a pocket chronometer to the station. The sun should be near the prime vertical and at a low altitude; the theodolite must be very carefully levelled, especially in the position with the telescope pointing towards the sun. To elimin­ate instrumental errors the observations should be repeated with the vernier set at intervals equidistant along the arc, and a.m. and p.m. observations should be taken at about equal altitudes.

At sea true bearings are obtained by measuring with a sextant the angle between the sun and some distant well-defined object making an angle of from 100° to 120° and observing the altitude of the sun at the same time, together with that of the terrestrial object. The sun’s altitude should be low to get the best results, and both limbs should be observed. The sun’s true bearing is calculated from its altitude, the latitude, and its declination; the horizontal angle is applied to obtain the true bearing of the zero. On shore the theodolite gives the horizontal angle direct, but with sextant observations it must be deduced from the angular distance and the elevation.

For further information see Wharton, *Hydrographical Surveying* (London, 1898); Shortland, *Nautical Surveying* (London, 1890).

(A. Μ. F.\*)

**“SURVILLE, CLOTILDE DE,”** the supposed author of the *Poésies de Clotilde.* The generally accepted legend gave the following account of her. Marguerite Êléonore Clotilde de Vallon Challis, dame de Surville, was bom in the early years of the 15th century at Vallon. In 1421 she married Bérenger de Surville, who was killed at the siege of Orleans in 1428. Her husband’s absence at the war inspired her heroic verses and his death her elegiac poems. The last of her poems is a *chant royal* addressed to Charles VIII.

In 1803 Charles Vanderbourg published as the *Poésies de Clotilde* some forty poems dealing with love and war. 'The history given in the introduction of the discovery of the manu­script was evidently a fable, and the poems were set down by most authorities as forgeries, especially as they contained many anachronisms and were written in accordance with modern laws of prosody. The manuscript had been in the possession of Jean François Marie, marquis de Surville, an *émigré* who returned to France in 1798 to raise an insurrection in Provence, and had paid the penalty with his life. In 1863 Antonin Macé made further inquiries on the subject and discovered letters from Vanderbourg to Surville’s widow. This correspondence makes it clear that Vanderbourg was innocent of forgery and believed that the poems were of 15th-century date, and that the anachronisms of matter and form were due to retouching by Surville. But the researches of Μ. Macé interested local antiquarians, and documentary evidence was produced that the wife of Bérenger de Surville was Marguerite Chalis, not Clotilde, and that the marriage dated only from 1428. Moreover Bérenger, whose death at the siege of Orleans was one of the leading motives of the book, lived for twenty years after that date. Friends of Μ. de Surville also disclosed the fact that the marquis had contributed archaic poetry to a Lausanne journal.

See A. Macé, *Un procès d'histoire littéraire* (1870); A. Mazon, *Marguerite Chalis et la légende de Clotilde de Surville* (1875) ; articles by Gaston Paris in the *Revue critique d'histoire et de littérature* (March 1*,* 1873 and May 30, 1874), by Paul Cottin in the *Bultetin du bibliophile* (1894); E. K. Chambers, *Literary Forgeries* (1891); and further references in the *Bibliographie des femmes célèbres* (Turin and Paris, 1892, &c.).

**SUS,** a province of southern Morocco, once an independent kingdom, and still too unruly to be opened to Europeans, who have nevertheless for centuries past made efforts to secure a foothold. Its principal towns are Tarudant, High (the old capital), and Glimin on the Wad Nun. Tarudant, the present capital, flourished in the 12th century on account of the neigh­bouring copper-mines. Saltpetre is now the only important product. Ports might be opened at Agadir Ighir (once occupied by the Portuguese for thirty years as Santa Cruz), Massa, Ifni, Arksis and Assaka at the mouth of the Wad Nun. As a coveted district, all kinds of natural riches are attributed to Sus, but it may be assumed that they are exaggerated. Europeans land at their peril, since the coast is by imperial order closed to trade, no custom-house being provided. Most of the business of Sus is carried on at great fairs lasting eight or fifteen days, during which time all roads of approach are guaranteed safe by the tribesmen that trade may be uninterrupted. Caravans from Sus laden with copper-ware, olive oil, butter, saffron, wax, skins, dates, dried roses, &c., are sent to Marrakesh, four days’ journey from Tarudant. Susis are well known in the north of Morocco as able tradesmen and clever metal workers. They live frugally, and are only prodigal in powder and human life. Their language is almost exclusively Shilhah, a dialect of Berber. (K.A.M.\*)

**SUSA** (Biblical, *Shushan),* the capital of Susiana or Elam and from the time of Darius I. the chief residence of the Achae- menian kings. It had been the centre of the old monarchy of Elam and had undergone many vicissitudes before it fell into the hands of the Persians (see Elam). The site, fixed by the explorations of W. K. Loftus, lies in the plain, but within sight of the mountains, between the courses of the Kerkha (Choaspes) and the Dizful, one of the affluents of the Pasitigris. The Shaur, a small tributary of the Dizful, washes the eastern base of the mounds of Shush, and seems to be the representative of the ancient Ulai or Eulaeus. Thus the whole district was fruit­ful and well watered; the surrounding rivers with their canals gave protection and a waterway to the Persian Gulf; while the position of the town between the Semitic and Iranian lands of the empire was convenient for administrative purposes. Susa therefore became a vast and populous capital; Greek writers assign to it a circuit of 15 or 20 m.

The remains include four mounds, of which one is the site of the citadel called Memnonion by the Greeks, while another (the Apadana to the east of it) represents the palace of Darius I. and Artaxerxes II. *Mnemon* This latter has been excavated by Μ. Dieulafoy and the enamelled bricks with which its walls were adorned are now in the Louvre. South of these two mounds is the site of the royal Elamite city. The fourth mound, covering the remains of the poorer houses, is on the right bank of the river between the Shaur and the Kerkha. J. de Morgan’s excava­tions (since 1897) have been principally in the citadel mound, which measures rougnly 1500 ft. by 825 ft. and is 125 ft. high. The two lowest strata belong to the stone age, and the first is characterized by a fine thin pottery, with yellow paste decor­ated with geometrical patterns and animal or vegetable figures in black and brown-red. Some of it is similar to the prehistoric