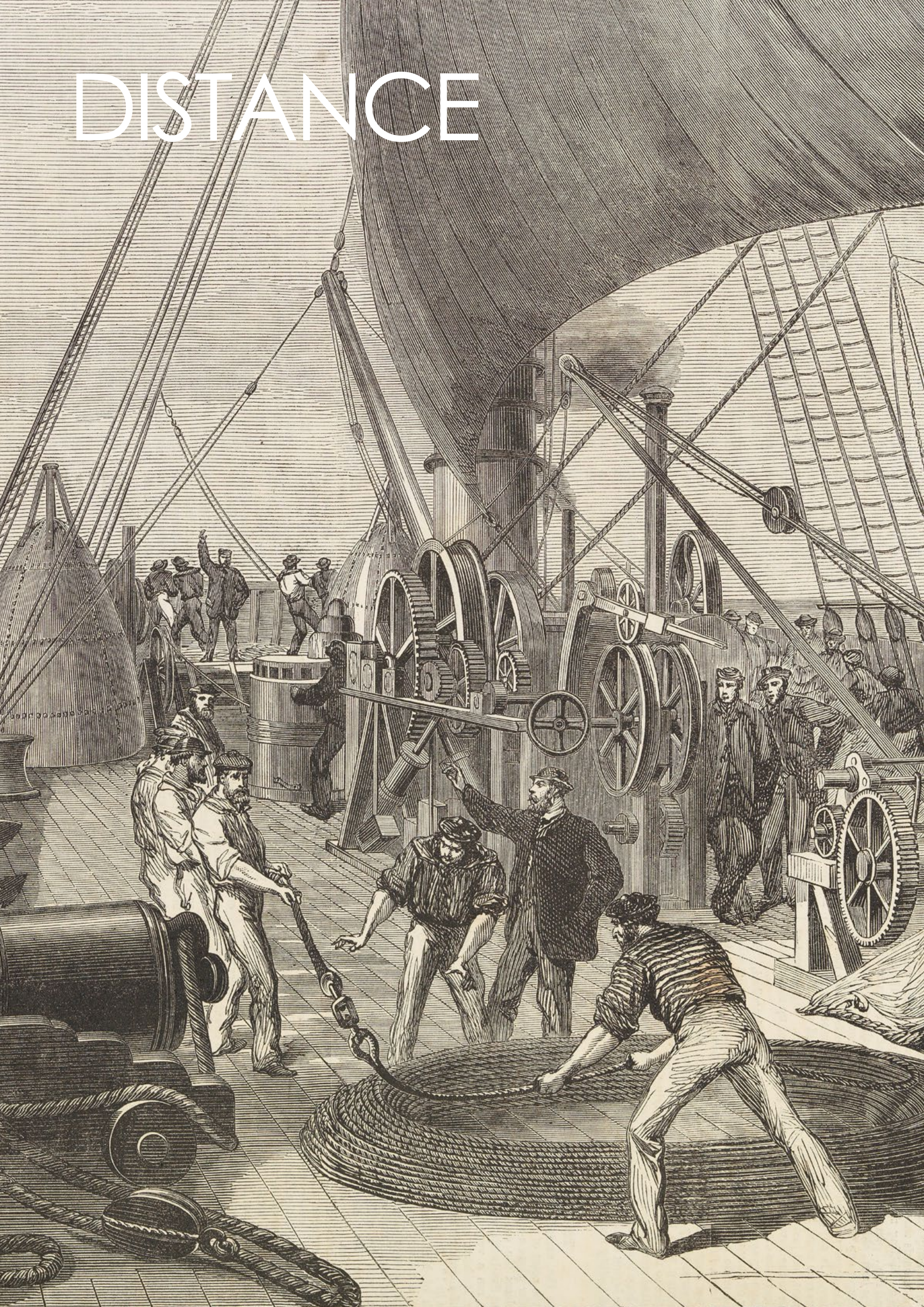
DISTANCE



from VICTORIANS DECODED: ART AND TELEGRAPHY

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Designed by Olivia Alice Clemence

BACK AND FRONT COVER:
James Tissot, *The Last Evening*, 1873 (details), The Guildhall Art Gallery, Corporation of London.

DISTANCE

CASSIE NEWLAND

CHATTERTON'S COMPOUND

Chatterton's compound was an adhesive invented by John Chatterton of the Gutta-Percha Company. It swiftly became one of the material mainstays of the submarine cable industry.[1] It was developed to address a long-standing problem in the manufacture of submarine cable whereby the layers of gutta-percha insulation would separate from each other and from the copper core.[2] Chatterton's compound was applied to the copper conductor before the application of the first layer of gutta-percha and also between every subsequent layer of gutta-percha. A further and final covering was sometimes applied to the finished core to aid in the adhesion of the hemp or jute wrapping.[3] Ayrton in his *Preliminary catalogue of the apparatus in the Telegraph Museum* gives the recipe for Chatterton's Composition as being by weight:

One part Stockholm tar
One part resin
Three parts gutta-percha.[4]

These ingredients were heated together to form a viscous liquid. The copper conductor or partially formed cable core would then be pulled through a hot bath of the compound immediately prior to the application of the gutta-percha.

Stockholm Tar is a pine tar, the name refers not to tar made or manufactured in Stockholm but to all tar exported by the Norrländska Tjärkompaniet. Known variously as The Swedish Tar Company or The Stockholm Tar Company, the company had been granted an export monopoly in 1648 by the King of Sweden.[5] This gave them exclusive rights over the export, carriage and sale of Swedish tar, ensuring that every barrel of tar produced in Sweden was brokered, shipped and sold exclusively by Swedish traders at whatever price the market would support. The moniker 'Stockholm' stems from the practice of burning the name of the port of export on the side of every barrel. As Stockholm had become the only legal port of export, Stockholm Tar became synonymous with Swedish tar in general. The Swedish Tar Company continued to trade under various names and in various guises for several hundred years. Gamble notes that the monopoly was still in place at the turn of the twentieth century.[6] The monopoly, though despised internationally, ensured that only tar of consistent quality was exported from Sweden. Buyers could be assured that all barrels had been inspected and graded. Stockholm tar consequently earned itself a reputation as not only being of a consistently good quality but as the very finest available. Kaye notes that even the lowest grade of Swedish tar was still considered to far outstrip its rivals from Russia and the United States in terms of quality.[7] Stockholm tar was therefore the product of choice for all naval, military and industrial purposes, indeed, it dominated the naval stores market well into the twentieth century.[8] Prices were (as the saying goes) reassuringly expensive, kept high by the Swedish traders.

Stockholm tar is produced using traditional methods, which appear to differ little either by region or by antiquity. Villstrand argues that the methods of production remained static from 1600 onward.[9] Tar is produced in a structure known as a tjärdal, literally 'tar valley' in Swedish, as the method of construction involves the digging of a trench or ditch into the slope of a hillside. A pipe, or a timber trough is laid along the bottom of this trench. A funnel-shaped pit is then created at the high end by the erection of bank separating it from the downhill slope.[10] This creates the distinctive funnel shape earthwork which is to be found archaeologically. The pit is then lined with either birch bark of flat stones to prevent the tar seeping into the ground during burning. The funnel-shaped pit would be carefully stacked with pine timber, covered with peat or white moss and burnt in a controlled manner for several days until the tar runs down the trench and can be caught in barrels at the bottom.

The second ingredient in Chatterton's compound is resin. Other sources substitute the word rosin. These are not necessarily typographic mistakes or contradictory suggestions as rosin is simply a kind of resin. From the mid-nineteenth to the mid-twentieth centuries rosin was by far the most common type of resin in production. Rosin was a staple of the naval stores industry (which also included tar, pitch, turpentine and timber) and may be therefore be considered the only likely candidate for the 'resin' employed in the manufacture of Chatterton's compound. Rosin is a product of the pine tree. When wounded, a pine tree produces a gum to seal the site of the injury. This gum can be collected by tapping and distilled to produce two of the staples of the naval stores industry: turpentine and rosin. When the gum from a particular tree had been exhausted it was given over to the lumber industry to provide other naval stores, timber, tar and pitch.[11]

The rosin from the Longleaf pine is particularly plentiful and free-flowing and so the centre of world rosin production was therefore in the Longleaf pine forests of the south-eastern states of the USA. The 'piny woods' stretching from North Carolina, through South Carolina, Georgia and Alabama in a coastal band 60 to 80 miles (97 to 129km) wide, some 60 to 90 million acres (24 to 36 million hectares).[12] The largest producer of turpentine and rosin was North Carolina.

Frederick Olmstead, a travel writer in the 1850s, notes that North Carolina's prominence in the industry was due to several interacting factors, all of which had their roots in the slave economy and its ample labour supply. First, land in the south was generally worked for profit rather than subsistence. Whereas the pine forests of South Carolina, Georgia and Alabama could be profitably logged, cleared and turned over to the raising of plantation crops, such as cotton, the soil of North Carolina was generally unsuited to this. The only large-scale industry able to turn a profit in North Carolina (except rice in the squishy bits) was therefore 'turpentining', as the parallel practices of producing both turpentine and rosin were known. A second factor identified by Olmsted (writing in 1856, before the Civil

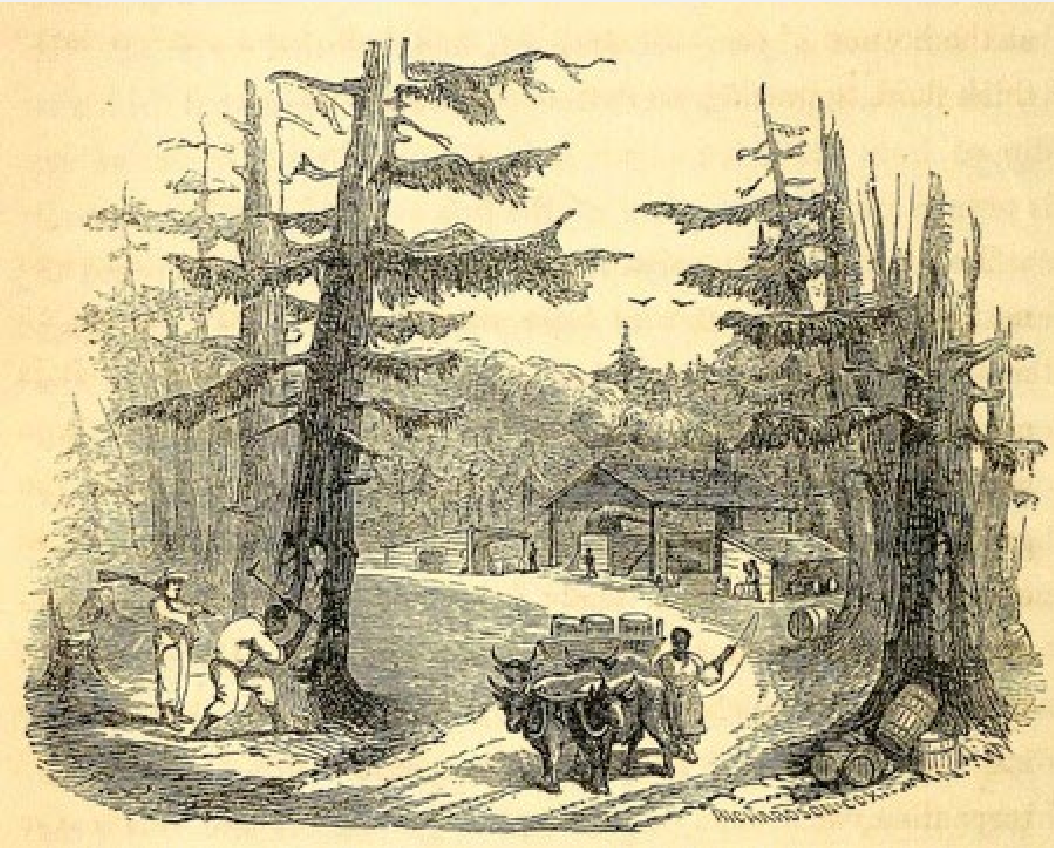

Fig. 1, F. L. Olmsted, *A journey in the seaboard slave states: with remarks on their economy* (New York: Dix & Edwards, 1856), p. 344. This is a North Carolina scene. Rosin is being collected from a pine tree (bottom left) and a forest distillery is in the background.

War and the subsequent abolition of slavery) was the vital importance of slave labour at the inception of the industry. He suggested that it was only the low-cost labour provided by an inherited slave stock (about 35 per cent of North Carolinian families owned slaves)[13] that allowed the labour-intensive practice of turpentining not only to turn a healthy profit but to develop in the area at all.[14] Indeed, the slump in naval stores production from throughout the slave-holding states after the American Civil War (1861-65) was not reversed until rising international prices for rosin and turpentine allowed the industry to run at full market wages.

The following description of turpentine collection and distillation is largely taken from Olmsted's experiences of travelling through the Old Southern States in the mid 1850s. The descriptions would still appear to be a valid characterisation of the industry in the 1870s because, as Outland notes:

> Gum harvesting changed none at all ... The tools and equipment also remained the same. Boxing axes, hacks, pullers, dippers, scrapers, and stills were neither improved nor replaced. This lack of advancement was not an unusual characteristic

of southern industry.[15]

Preparing a suitable forest began in November and ended the following March. These initial months were spent engaged in 'boxing'. Boxing was the cutting of an angled hole at the base of a pine tree approximately 20 to 40cms wide and 7 to 10cms deep. The box sloped inward towards the heart of the tree to create a kind of hollow container within the trunk which could contain one to two litres. The number of boxes cut into any given tree was dependent on size, with a large tree being able to sustain three boxes. A strip of bark about 10cms wide (or the width of a man's palm) was left between each box to sustain the tree. Outland notes that experience was an important factor in judging box placement. Factors, such as the angle of lean, trunk shape, and predominant weather conditions had to be taken into consideration.

Once the boxes were in place they were 'cornered', a process whereby triangles were cut into the top corners of each box to channel the gum. From this moment the gum would begin to flow into the box. To maintain the flow of gum the tree had to be 'chipped' at intervals (depending on the age of the box and the season) which involved cutting away a strip of bark directly above the box to reveal a new patch of undamaged phloem referred to as the 'face'. Repeated chipping led to a slow upward creep of the exposed face, with older trees being chipped to a height of three metres or more. The gum would be collected from the boxes using a 'dipper' (the same shape as the constellation).

The distilling process generally lasted between two and two and a half hours and resulted in two products, rosin and turpentine.[16] On heating to around 300°c the turpentine floated to the top and was run off into the condensing coil where it was cooled and decanted into barrels. The heavier liquid rosin remained in the still. This was then cooled until it had obtained the consistency of molasses at which point it was passed through a series of screens designed to filter out the debris and foreign matter acquired during harvesting. Rosin could be packed into cheap and shoddy barrels as it quickly set to a solid preventing leakage during transport.[17]

The UK was the largest single consumer of rosin, importing hundreds of thousands of barrels annually.[18] The vast majority of those barrels ended up on the wharves of the cable factories in London where they sat alongside the Stockholm tar from Sweden: two materials taken from trees, which though related by species, were separated by several thousand miles of Atlantic ocean. Inside the factories they were blended with the gum of a third tree – the exotic *Palaquium gutta* from the Malay peninsula – to form Chatterton's compound. This truly international product, the first step toward synthetic plastics, revolutionised the submarine cable industry allowing the tendrils of Empire to snake around globe. When people refer to London as the 'melting pot' of the world, it is easy to imagine that pot to be full of Chatterton's compound.

1. S. Roberts, *Distant Writing: A History of the Telegraph Companies in Britain between 1838 and 1868* (2006), p.128, http://distantwriting.co.uk (consulted 3 September 2016).

2. W. E. Ayrton, *Preliminary catalogue of the apparatus in the Telegraph Museum* (Bristol: Bristol Selected Pamphlets, 1877), p. 14.

3. J. Munro, *Nerves of The World*, (unknown publisher, 1895), transcribed by B. Glover, (2008) http://tinyurl.com/zq25lv4 (consulted 3 September 2016).

4. Ayrton, *Preliminary Catalogue* (1877), p. 14.

5. R. Outland, *Tapping the pines: the naval stores industry in the American South* (Louisiana State Univesity Press, 2004), p. 9.,

6. T. Gamble, 'How The Famous "Stockholm Tar" of Centuries of Renown Is Made' (1914), in T. *Gamble Naval Stores: History, Production, Distribution and Consumption* (Savannah, Georgia: Review Publishing & Printing Company, 1921), pp. 46-7.

7. T. P. Kaye, 'Pine Tar; History And Uses', *Third International Conference on the Technical Aspects of the Preservation of Historic Vessels* (San Francisco: San Francisco Maritime National Park Association, 1997), p. 1.

8. Gamble, *Naval Stores* (1921), p. 46.

9. N. E. Villstrand, 'Skogen, Bonden och Tjaran' (2003, updated 2007), http://tinyurl.com/h4h3ubp (consulted 3 September 2016).

10. B Hjulstrom, 'Organic Geochemical Analysis for pine tar production in middle Eastern Sweden during the Roman Iron Age', *Journal of Archaeological Science*, vol. 33 (2006), pp. 284-6.

11. Outland, *Tapping the Pines* (2004), p. 267.

12. Ibid., p.14.

13. J. G. Randall & D. Donald, *Civil War and Reconstruction* (Lexington: D C Heath & Co., 1961), p. 68.

14. F. L. Olmsted, *A journey in the seaboard slave states: with remarks on their economy* (New York: Dix & Edwards, 1856), p. 338.

15. Outland, *Tapping the Pines* (2004), p.127.

16. Ibid., p. 75.

17. Ibid., p. 77.

18. T. Gamble, 'The World Wide Consuption of Naval Stores', in Gamble, *Naval Stores* (1921), pp. 91-95.