strictly proportional to some particular power of the density, viz. either to the simple density, as was done by Newton, or to some higher power of it, as was in effect done by Laplace and his followers. Now, such proportionality of the fluid pressure to any uniform power of the density, would obviously require the particles constantly to observe the same uniform arrangement during their vibrations, so as to have the like distances between the adjacent particles of any small portion of the air everywhere to vary inversely as the cube root of the density, with, perhaps, the mere exception of as much difference of arrangement as is unavoidably due to the density being different in different parts of a wave of air. But it is easy to see that the two assumptions are so inconsistent that only the one of them could be strictly true ; because vibrations performed accurately in the direction of the sound necessarily imply that (abstracting from the very insignificant change of distance due to the sound’s being propagated in lines which are slightly diverging, because radiating from the source of sound) the distances of the par­ticles of the air, estimated perpendicularly to the direction of the sound, would not be altered by or during these vibrations ; and consequently that the density of any minute volume of the air, instead of varying alike in all its three dimensions, would vary in only one of them, namely, in the direction alone in which the sound is propagated through it.

But, independently of the incompatibility of the two as sumptions, the extreme rapidity or short duration of the vibrations, whilst it gives some probability to the first, throws as much doubt on the second. Nay, any thing like a strict fulfilment of the second assumption seems, on this and various other accounts, to be extremely improbable, particularly because, in order to preserve a uniform arrangement, it would require the most of the particles, notwithstanding the rapidity of their vibrations, to describe lines deviating so much and in all manner of ways from the direction in which a clear sound is understood to be propagated, that, granting such interwoven vibrations to be possible, they could be expected to produce nothing but a very confused noise. Nor is it easy to conceive how, on that supposition, two different sounds could ever cross each other’s paths without seriously interfering, which does not appear to be the fact. On the other hand, if we may not strictly adhere to the first assumption, yet, by taking a mean between the two, it would follow that the increase of the repulsion due to condensation, and the diminution of it due to dilatation, being both of them principally if not entirely confined to the direction of the sound, they would both be so much the greater in that direction ; and by thus constituting an increased disturbance in the equilibrium of the repulsion reckoned in that same direction, they would have a precisely si­milar effect on the result, as if the pressure of the air in its otherwise supposed strictly fluid character had followed the ratio of a higher power of the density than it really does. Now, such an effect would obviously tend to shorten the duration of the vibrations, or to increase the theoretical velocity of sound, which is just the thing required in order to make it agree with observation.

The preceding remarks become far more striking with respect to the attempt which Poisson has always been con­sidered to have made successfully (*Journal Polytechnique,* tome vii. p. 364), to show that the velocity of sound would still be the same, although the vibrations were considerable, and confined to a single straight line.

Doubts have been started if the air really consists of par ticles, and whether it may not rather have some undefinable constitution ; but such vague considerations cannot materially alter the case, whilst there can be no question that the air, like all other matter, has inertia when at rest, and momentum when in motion ; and also that as long as it is considered to preserve or act strictly in its fluid character,

the matter of which any minute volume of it consists must be uniformly distributed. For it is upon properties essentially the same with these that the above remarks are founded. (e. ε. ε.)

Sound, in *Geography,* denotes in general any strait or inlet of the sea between two headlands. The name is given by way of eminence to the strait between Sweden and Denmark, joining the German Ocean to the Baltic, being about three miles over.

*SoundBoard,* the principal part of an organ, and that which makes the whole machine play. It is a reservoir, into which the wind, drawn in by the bellows, is conducted by a portvent, and thence distributed into the pipes placed over the holes of its upper part. The wind enters them by valves, which open by pressing on the keys, after the registers are drawn, by which the air is prevented from passing into any of the other pipes besides those in which it is required.

*SoundBοard* also denotes a thin broad board placed over the head of a public speaker, to enlarge or extend and strengthen his voice. Soundboards are found by experience to be of no use in theatres, as their distance from the speaker is too great to be impressed with sufficient force. But soundboards over a pulpit have frequently a good ef­fect, when the case is constructed of a proper thickness, and according to particular principles.

SOUNDS, Musical. See Music.

SOUNDING, the operation of trying the depth of the sea and the nature of the bottom, by means of a plummet sunk from a ship to the bottom. There are two plummets used for this purpose; one of which is called the *hand·lead,* weighing about eight or nine pounds ; and the other the *deep-sea lead,* which weighs from twenty-five to thirty pounds ; and both are shaped like the frustum of a cone or pyramid. The former is used in shallow waters, and the latter at a great distance from the shore, particularly on approaching the land after a seavoyage. Accordingly the lines employed for this purpose are called the *deep-sea lead line,* and the *handlead line.* The handlead line, which is usually twenty fathoms in length, is marked at every two or three fathoms ; so that the depth of the water may be ascertained either in the day or night. At the depth of two or three fathoms there are marks of black leather ; at five fathoms, there is a white rag ; at seven, a red rag; at ten, black leather; at thirteen, black leather; at fifteen, a white rag; and at seventeen, a red rag.

Sounding with the handlead, which by seamen is called *heaving the lead,* is generally performed by a man who stands in the main chains to windward. Having the line quite ready to run out without interruption, he holds it nearly at the distance of a fathom from the plummet ; and having swung the latter backwards and forwards three or four times, in order to acquire the greater velocity, he swings it round his head, and thence as far forward as is necessary ; so that by the lead’s sinking while the ship ad vances, the line may be almost perpendicular when it reaches the bottom. The person sounding then proclaims the depth of the water, in a kind of song resembling the cries of hawkers in a city. Thus, if the mark of five fa thoms is close to the surface of the water, he calls, “ By the mark five ;” and as there is no mark at four, six, eight, &c< he estimates those numbers, and calls, “ By the dip four,” &c. If he judges it to be a quarter or an half more than any particular number, he calls, “ And a quarter five, and a half four,” &c. If he conceives the depth to be three more than a particular number, he calls it a quar ter less than the next: thus, at four fathoms and three fourths he calls, “ A quarter less five.”

The deep-sea lead is marked with two knots at twenty fathoms, three at thirty, and four at forty, and so on to the end. It is also marked with a single knot in the mid