

is suddenly emptied, as immediately after delivery in woman, this resistance is at the lowest, consequently the effect of descent of the diaphragm on the circulation is but slight, compared with that state which obtains when the parietes are in a high state of health, and the intestines are fully distended with gas, &c.

It must be evident that the amount of blood contained in the vessels within the abdomen must vary much, according to the tension of the parietes ; but this matter does not belong to the subject of this note.

III. "Note on the Auxiliary Forces concerned in the Circulation of the Pregnant Uterus and its Contents in Woman." By J. BRAXTON HICKS, M.D., F.R.S., F.L.S., &c. Received March 26, 1879.

Whatever view we may take of the structure of the placenta, it is generally admitted that both in the large sinuses in the walls of the pregnant uterus, and also in the decidual processes in the placenta as well as in the intervillal spaces the motion of the fluids can be but very slow, that is, if the circulation wholly depended upon the maternal cardiac impulse.

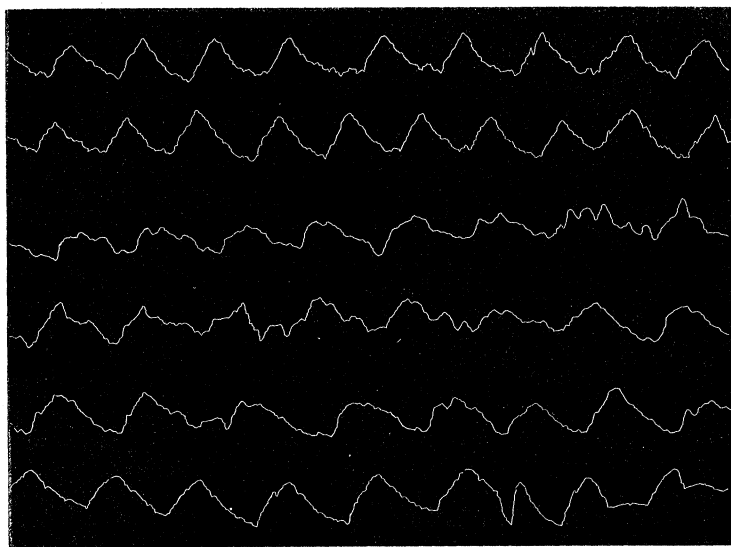
However, in 1871,* I pointed out a fact which had not been before observed, that the uterus was in the habit normally of alternately relaxing and contracting every five, ten, or twenty minutes during the whole of the pregnancy from the earliest period, at least from the second month, and not as had before been believed only under irritation, and towards the end of gestation. This movement is doubtless homologous with the peristaltic movements in the uteri of the lower animals.

In that paper I pointed out—1st, that these movements of the uterus provide for the frequent movement of the blood in the uterine sinuses and the decidual processes ; and, 2ndly, that they facilitate the movement of the fluid in the intervillal space of the placenta, or in that which has been called the placenta sinuses, and I remarked, "Whatever view we may hold of the structure of the placenta, whether on the one hand there be blood amongst the villi in maternal sinuses, or on the other merely a serous fluid, in any case it is through one or the other medium the villi absorb the material for the aëration of the foetal blood ; and there can be no doubt that from its position it must be in a more or less stagnant state. It is not difficult, therefore, to recognise the effect which the change in the solidity and shape must produce on the fluids in the placenta, as well as in the uterine walls.

* "Obst. Trans. Lond.," vol. xii. "On the Contractions of the Uterus during Pregnancy : their Physiological Effects and Value in the Diagnosis of Pregnancy."

In other words, these contractions of the uterus act as a kind of supplementary heart to these fluids."

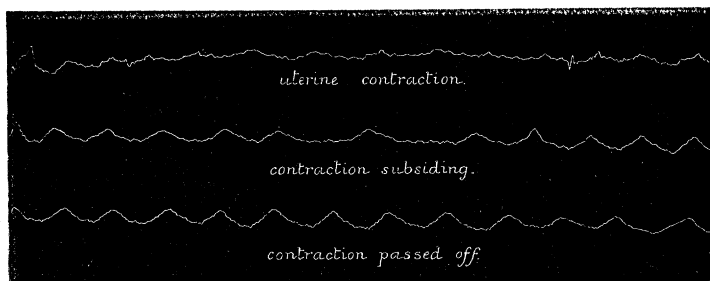
To this force I have now to add the effect of the respiratory movements on the gravid uterus and its contents. Any one who places his hand on the abdomen of a pregnant woman over the centre of the uterus will be conscious of the projecting forward of the uterine wall. But I presume this has been supposed hitherto to be merely the projection of the uterus *en masse*. Admitting that a slight portion of the movement is owing to that, I shall endeavour to show that the much greater portion of the movement is due to the bulging out of the walls by the downward pressure on the fundus during inspiration. This is best demonstrated by a cardiograph constructed with a button tambour, supported by three legs, capable of being adapted by screws to the proper length; these should be as far apart as possible, four inches or so. The patient should be placed on her back, and the tambour tied gently on to the abdomen by a tape passed round the back. The drum being set revolving, the respiratory movement is traced. The respiratory markings are very regular considering the circumstances, interrupted at irregular intervals by the foetal movements, coughing, and other movements of the body.



Normal Respiratory Wave over Pregnant Uterus. The *sub*-readings depending probably on arterial impulse of mother; and of the foetus.

Now, it is clear that the readings express the difference of elevation of the uterine wall between the tambour button and the circle enclosed by the legs; in fact, the amount of the bulging of the wall within

that area. If it were not so, and but the pushing forward of the mass, no difference would exist, and, consequently, no reading obtained. And this is proved by observing the effect on the readings when the uterine contractions occur, to which I alluded at the commencement of this note; for, when these supervene, we find the respiratory readings reduced almost to nothing, and, instead of the high elevation waves of the tracing, well shown before, the line is nearly level. Thus, when the uterus, in consequence of the increased firmness of its walls, cannot be impressed nor can bulge, we have the effect of the descent of the diaphragm to a similar extent reduced. This being admitted, it is clear that every respiratory action causes a movement of the fluids contained within the uterus, thus assisting the circulation in a part apparently removed from the maternal cardiac impetus. It may be worthy of notice, that at the earlier period of pregnancy, the uterine walls are less yielding, and, therefore, less influenced by the respiratory act, but then the assistance this renders at a later period is not so much required, because neither are the sinuses so large nor the decidual processes with their sinuses so deep, nor the thickness of the placenta so great. Gradually as the uterus increases, its walls are more yielding and the force of the respiratory movement more felt within.

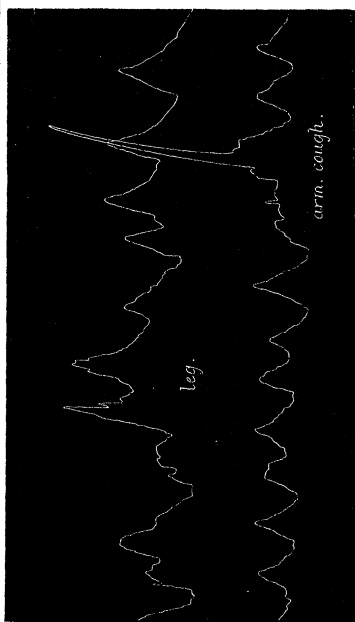
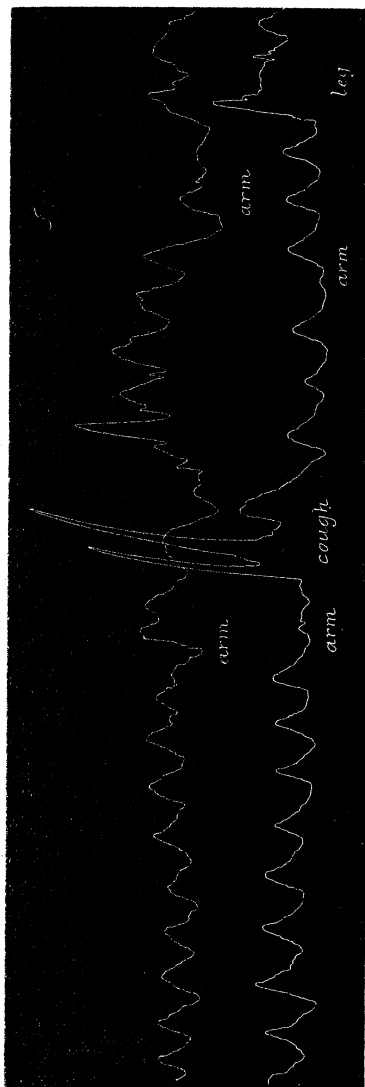


The effects of Uterine Contractions during Pregnancy in reducing the height of the Respiratory Wave is seen by comparing the first line with the last. This tracing was taken with a smaller instrument.

There are other points of interest in this registration of the respiratory movements of the abdomen, which do not belong to the subject under consideration, and are, therefore, omitted here.

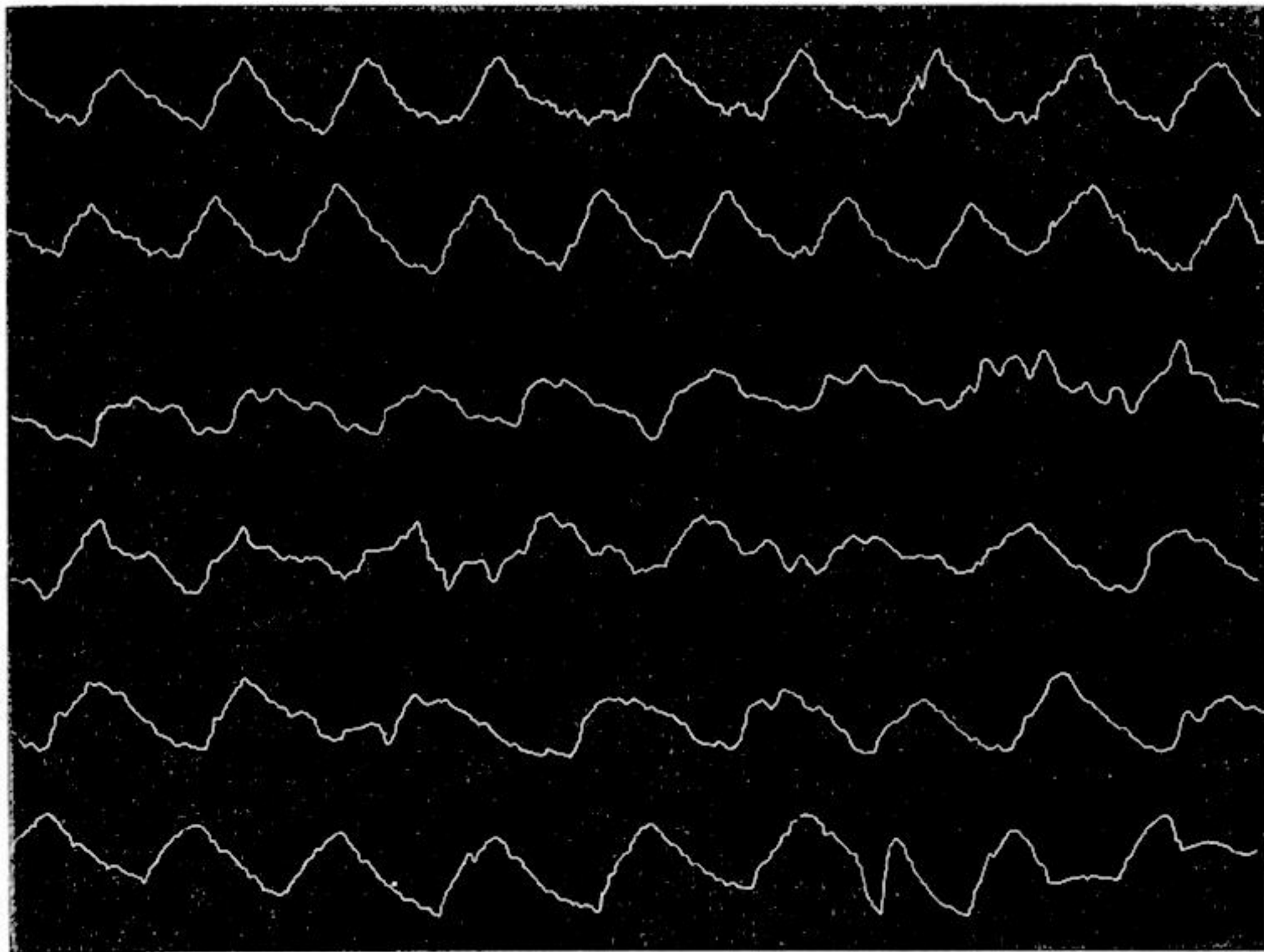
But there are other accessory forces to be noticed which act on the surface of the pregnant uterus, tending to the movement of the fluids within; namely, the muscular movements of the body, tending to cause a change of shape of the thorax or abdomen. These are quickly shown by the same arrangements as that by which the ordinary respiration is shown. The elevation of the arm, a hoist of the body, and, in particular, coughing, show a much greater force than is exerted by inspiration. Hence, one might fairly infer that exercise

in general in moderation will expedite the flow of the fluids in the uterine vessels, &c., and, also, that a sudden severe action will tend to urge it forward so quickly, before the vessels can convey it onward,

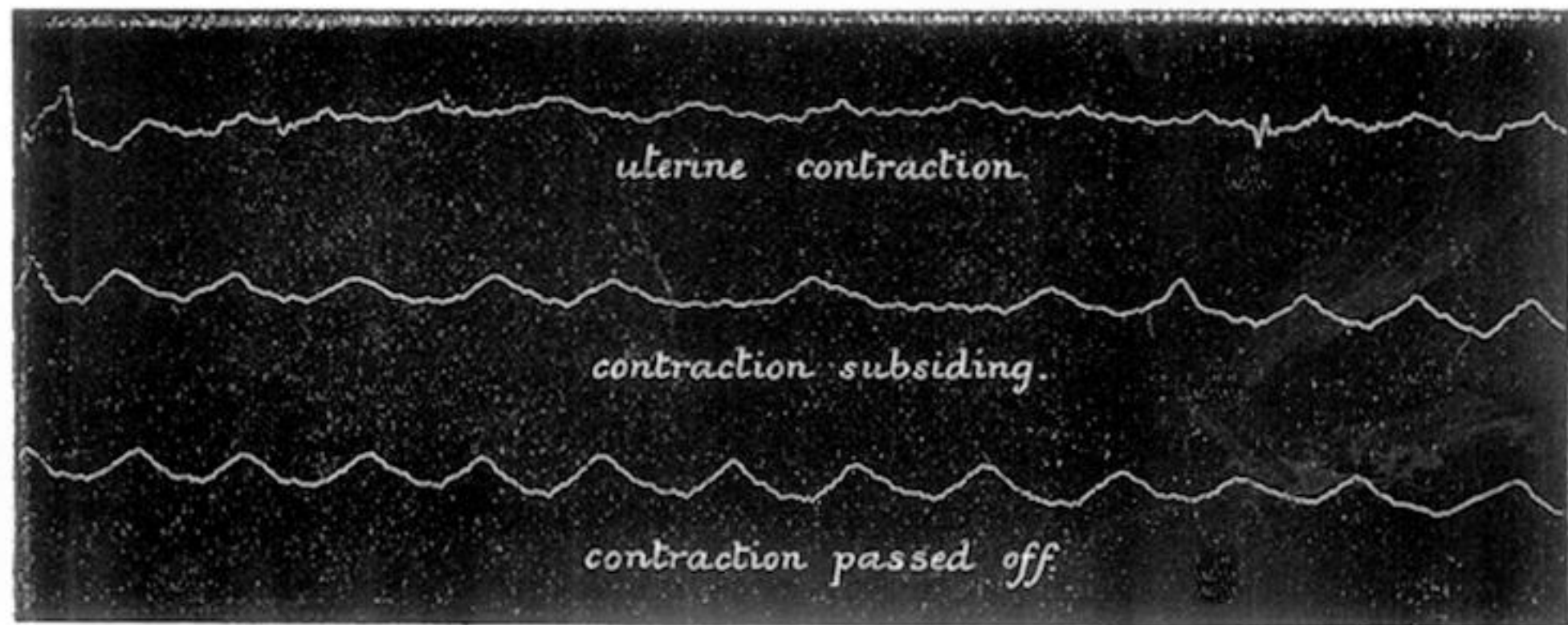


Tracings from Abdomen over the Uterus Pregnant at 8th month, showing the ordinary Respiratory Wave, interrupted by movements of arm, leg, and of coughing.

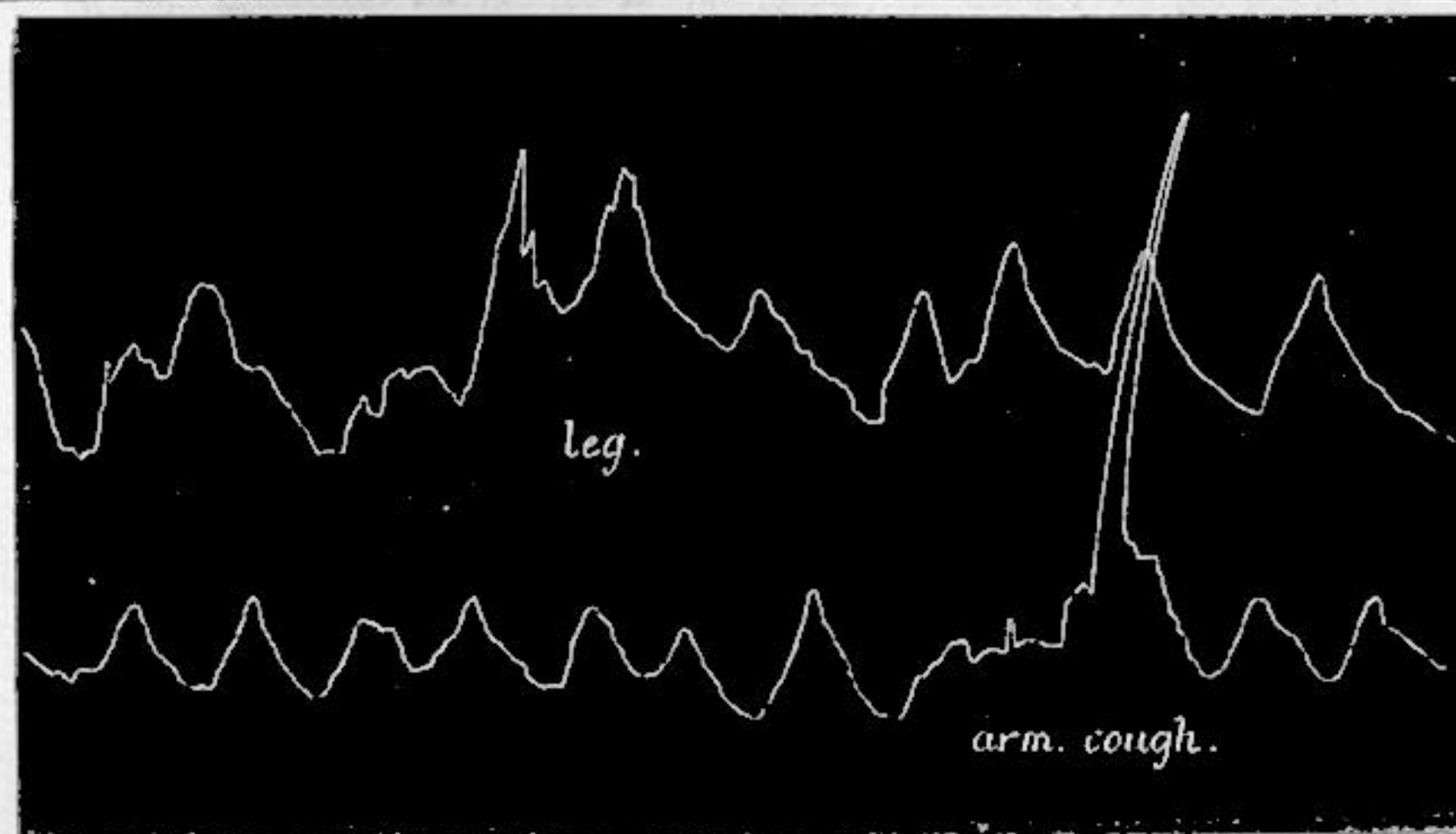
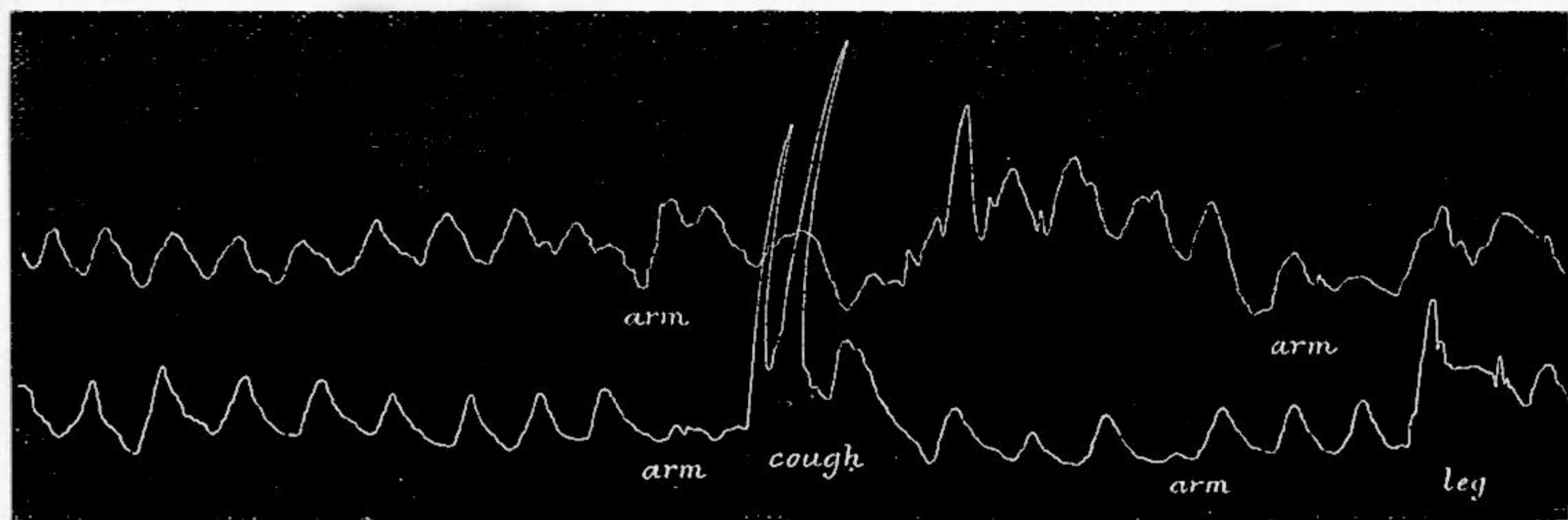
that their rupture would result and effusion of blood be a natural consequence:—a result which experience shows actually occurs under such circumstances.



Normal Respiratory Wave over Pregnant Uterus. The *sub*-readings depending probably on arterial impulse of mother; and of the foetus.



The effects of Uterine Contractions during Pregnancy in reducing the height of the Respiratory Wave is seen by comparing the first line with the last. This tracing was taken with a smaller instrument.



Tracings from Abdomen over the Uterus Pregnant at 9th month, showing the ordinary Respiratory Wave, interrupted by movements of arm, leg, and of coughing.