

cavity of the chest filled with air. In the former case, it continues only during inspiration; in the latter, only during expiration. These conclusions do not apply to those cases in which the wound has a valvular character, nor, without modification, to those in which air is escaping from a wounded lung into the pleural cavity.

A wound in the thorax, which affords greater facility for the entrance than for the exit of air, will cause an accumulation within the pleural cavity and consequently pressure upon the lung, and a greater or less degree of collapse of the latter. On the other hand, a valvular wound which favors the egress rather than the ingress of the air, will tend to a greater degree of inflation of the lung, than would occur if the wound were not valvular. So much for the behaviour of the lung when the thorax is opened in the healthy subject. But the case is quite different under the conditions which are present in empyema. Here we have the lung compressed to a greater or less extent by the effused fluid, in fact it may be reduced to a small fleshy mass, almost impervious to air. In addition to this it is covered by a more or less dense, unyielding pyogenic membrane formed from and upon the pulmonary pleura. It will be seen, then, that the conditions are unfavorable to the re-expansion of the lung, and just in proportion as these conditions are well marked will such re-expansion be imperfect, if not impossible.

Now, what is the mechanism by which expansion more or less perfect is obtained when the chest has been freely opened? We have removed the fluid from the thorax with a freedom proportioned to the size and character of the opening, and with it have removed the force by which the lung was compressed. We have made an opening through the chest wall which nullifies the effect of the respiratory movements of that side. The lung, then, is apparently removed from the operation of any force which could affect it either to compress or distend it. How then is it to regain its function even ever so imperfectly?

To the solution of this problem nature brings two new forces, which together are capable of producing remarkable results. One of these we have in a measure considered. This is the distending force of the air driven from the sound lung into its disabled fellow. In ordinary respiration this amounts to but little, but in the act of

coughing the force exerted is very considerable. Now, in these cases cough is always present, and thus at short intervals the sound lung is fully inflated, the glottis is closed, the expiratory muscles on the sound side are brought into special activity, and air is driven with force into the collapsed lung. In this way air passages long closed are opened up, adhesions confining the lung are little by little overcome, the thickened and rigid pulmonary pleura is stretched and thinned, and the way is prepared by which under the influence of the second force the lung may gradually be brought into a fairly active condition.

But this inflation of the compressed lung by the aid of the sound one, is antagonized to some extent by the reverse action which takes place in inspiration. With each expansion of the sound side the pressure within the affected lung is diminished, and a tendency to greater collapse is produced. This might be obviated by a different arrangement of the opening in the chest, as we shall see further on.

The second agency in distending the lung is the constantly advancing adhesion of the two pleural surfaces. During the presence of the fluid the summit of the lung is usually adherent to the chest wall, and after the fluid is evacuated the line of adhesion advances steadily downward, provided it is not interfered with by untoward influences. The process is similar to what we see when a burn affects the adjacent surfaces of two fingers. Union of the two granulating surfaces begins at the basis of the fingers and advances slowly towards the tips, resulting in a connecting web. So, too, in syphilitic ulceration of the throat, a line of adhesion forms between the soft palate and the wall of the pharynx, and advances gradually from the sides toward the centre.

In the case of the lung becoming thus adherent to the chest wall, it is forced to partake of the movements of the latter, and is pulled open with every inspiration, instead of being distended as in health by pneumatic pressure. It is as if the india-rubber bag, in this apparatus, were glued to the inside of the bellows.

In favorable cases, that is to say, in cases in which the compression has not lasted too long, and the adhesions which bind down the lung are not too strong, the expansion under the operation of these two forces may be complete. But