Glendenning

Percussion.

Percussion is of two kinds, immediate or direct and mediate.
In direct percussion the body is struck without the intervention of any substance. Mediate percussion is performed by striking some body, as a case of medicines or ivory upon the part to excite the stroke of the finger or hammer.
The instrument now generally in use is the plessimeter modified by M. Piorry from the original notation of M. Avenbrugger, and consists of an oval disc of ivory, two inches in length, and having two handles attached by which it is firmly held between the thumb and middle finger of the operator. Some its size and oval form it may be applied with the greatest precision to the chest of even the most emaciated subject. In practising mediate percussion the plessimeter ought to be pressed firmly down upon the part so as to preclude the possibility

Douglas Glendenning

of an Immediate admission between it and the Ear. Should a Space be left bet. -ween the Instrument & Sound struck by Ascertaining that called the Cracked. pot. Sound will be produced and thereby a Error in Diagnosis Committed.
The Percussion may either be made with the finger or with the Hammer Invented by L. Wintrich of Wurzburg.
There can be little doubt of the great superiority of the Hammer over the finger It produces a Sound which in clearness, intensity and penetrativeness can never be produced by the finger. It has also the advantage that it can be used by those who from the natural Conformation of their fingers are unable to bring them into such a position as will enable them to deliver the even blow requisite for the development of a clear percussion Sound. The difficulty usually arises from the relative length of the finger (the middle and index) underneath it. In-

-possible to strike the plexymeter with more than one finger.

Percussion is best performed upon the patient in the Sitting posture. It may be practised either upon the naked skin or with a thin covering of flannel or linen intervening but Care must be taken that the covering is not thrown into folds as they will materially affect the character of the sound. In percussing the organs of the abdomen the horizontal position will be the best with the thighs flexed so as to relax the abdominal muscles.

The patient should be placed upon the breast and abdomen when the kidneys are examined, and upon the right side when the Spleen is being percussed. In the Examination of particular organs the superposed muscles and skin ought to be rendered as flaccid as possible. If the Skin and Muscles are not upon the Stretch no abnormal degree of resistance is thereby communicated to the hand of the Operator

In Percussing the posterior surface of the chest and back the patient should be made to fold the arms across the chest so that the shoulder blades are brought into the same plane and as large an interspace as possible is obtained. Depress the head and throw the body somewhat forwards.

The plexmeter ought to be pressed firmly down upon the centre of the organ and the blow from the hammer delivered suddenly. Should the blow be delivered in an oblique direction vibrations are communicated to the organs in the neighbourhood and these kind of different densities from the one percussed or not. although different from the normal one will be produced. From the centre of the organ the plexmeter ought to be moved gradually towards the margin until the sound ceases to the neighbouring organ is produced. By then moving the plexmeter backwards and forwards attention to the varying tones and sense of resistance the line of demarcation

between the organs will be marked out with a wonderful degree of precision. It must be remembered that, even in health, a great many circumstances tend to increase or diminish the resonance of organs. Thus the resonance of different parts of the chest varies according to the quantity of muscle. The regions of the pectoral Muscles and of the Scapula are dull on percussion and the manubrium of the middle portion of the Sternum on the right side and the axilla are the most resonant. It is also of importance to remember that the resonance of the various parts of the chest is materially affected by its Contents. The chest contains besides the lungs the heart and great blood vessels. the former of which is in Contact with the internal wall of the chest thro' a surface nearly one inch in diameter. If a light blow be struck with the fingers on the Cartilages of the 5th and 6th ribs a pulmonal tympanitic sound will be produced but if the blow be heavier and the dull sound of the heart will be produced.

The same will be found to be the case when percussing over the false ribs on the right side owing to the presence of a thin layer of lung overlying the liver. The dull sound of the liver will also be found to reach higher up the chest in children than adults owing to the liver proportionately larger: and in some females the liver may be found, owing to tight lacing &c, to reach as high as the 6th. or even the 5th rib. On the left side of the chest; even in the same situation, we find great variations in the resonance and that between them in the same individual in a short space of time. The lower part of the left side of the chest is normally more resonant than the right owing to the presence of the stomach; but should this become distended with liquid and bulge up into the left side the sound will be dull: on the other hand should the organ become filled with and rise higher than usual the effect of percussion will be the production of a tympanitic ringing sound.

The resonance of the chest is greater in lean than in fat and muscular subjects: and also in old people the greater amount of cartilage between contained in the cartilages of the ribs renders the chest less elastic, and thereby, to some extent diminishes the resonance: but this effect is sometimes more than counterbalanced by the less amount of fat and muscular substance on the wall of the chest, and in some cases the resonance is increased by the presence of enlarged cells (air-cells) The resonance of the chest is greater after a full inspiration and less after a full expiration.

In the case of the abdomen of the fetus to sound lightly upon the walls and a slight blow struck a very distinct sound will be produced from that which is given out when the fist is firmly pressed down and forcibly struck. When firmly pressed down the walls of the intestines are thrown into vibrations and a clear tympanitic sound produced: but when pressed lightly the dull sound of the muscles and integuments is alone produced.

Should the large intestine be distended with gases a dull tympanitic sound will be produced but if it be empty a clear tympanitic sound will result. So also the lower part of the abdomen, when the bladder is greatly distended with urine, will give out a dull humoral sound: a dull tympanitic sound will likewise be produced when the gravid uterus extends up into the abdomen or an ovarian tumor is present.

Of the various sounds produced on Percussion.

Dr. Weber has arranged these sounds under four heads, viz - Full or Empty sound; Clear or dull (dead) sound: Tympanitic or Non-tympanitic sound: Amphoric resonance or Metallic tinkling, and the Cracked-pot sound.

The physical Condition of the full or empty sound depends upon the greater or less space in which sonorous sounds are propagated, so that: tissues containing no air give out an entirely empty sound.

If you perform percussion on the region of

the heart are entirely empty sound is produced: but over the upper and anterior regions of the chest a full sound is obtained. Extension to the side of the heart; where a thin layer of lung intervenes, gives a comparatively empty sound.

The Clear or dull (dead) sound depends upon a greater or less amount of non-conducting substance lying over the side of the production of sound. Thus a lung containing air and inclosed in soft elastic chest walls will yield a much clearer sound than when it is inclosed by thick non-elastic thoracic walls.

The tympanitic sound is produced on percussing the stomach or a part of the intestines filled with air without the wall being actually distended. No very satisfactory explanation has been given of the physical conditions on which this depends: it has, nevertheless, been found the constant

*Probably

result of experiment on the living subject.
If you remove the lungs and distend them with air the tympanitic timbre constantly disappears. The cause of this has not been explained but it is possible that the force of the distension is in some way the cause of the result. For in the case of the child drum, over which the membrane is stretched, percussion normally produces a tympanitic sound. The reason of this is *the less degree of tension to which the air is subjected in the latter case. It has been supposed that the tympanitic sound is only produced when air is subject to no kind of pressure and that only in a circumscribed space and that the tympanitic sound ceases when the membranes are stretched to a certain degree at which degree they vibrate indistinctly and that not in consonance with the air.
The clearest tympanitic sound is heard in pneumothorax when no fluid exists on the walls exists.

"Amphoric Resonance or Metallic tinkling."
If a lime cask or other closed vessel, hav-
-ing only a small empty, be smacked, the
sound denominated Amphoric Resonance is
produced. This sound must be distinq-
-uished from the Tympanitic sound.
If the bladder or Stomach of some Corpse
cannot be naturally inflated the Tymph-
-anitic sound is produced on percussion;
but if we inflate it to a further extent
so that the membranes are put upon the
stretch Amphoric Resonance or metallic
tinkling is produced. M. Piorry is of opi-
-nion the air and water are requisite for
the production of this sound but it has
been proved by experiment that it may
be produced by percussing Cavities Con-
-taining air alone. A larger Cavity than
is requisite for the production of the Tymph-
-anitic sound is necessary for the produc-
-tion of Amphoric Resonance: and perhaps
also the shape of the Cavity in some way
influences the sound and gives rise to this

pneumatic effect. In healthy persons percussion almost never produces emphysema and it is only under very exceptional circumstances that the hydropneumatic sound of the stomach is communicated into the former. If a stomach or bladder be filled with air and water and then shaken a loud ringing sound produced by the displacement of the air is heard while metallic tinkling is combined with the murmur of the shaken water. This sound is only detected in the human subject in the case. viz.: in hydropneumothorax and is produced on the patient being shaken when the tinkling echo of the displaced stream is sometimes loud enough to be heard at a little distance.

This has been called the Succussio Hippocratis and was thought by him, to be who gives directions for its diagnosis to depend upon symptoms which could not possibly give origin to the sound without coexistent pneumothorax.

"Cracked-pot sound". If the hands

be slightly closed so as to have a space between them containing air and then struck upon the knee a peculiar hissing sound, resembling the Cracked-pot sound, will be produced. Or again if the finger or pleximeter be applied upon the chest wall as before admitting air under it and then struck with the hammer the sound will also be produced. The sound is generated in the lungs when a large cavity communicated with a bronchus but not in Communication with the cavity of the pleura, exists immediately under the chest walls and is due to the rushing of air through a narrow opening (the bronchus) mingled with the sound of percussion. The percussion must be sufficiently strong and the elastic Condition of the chest sufficiently great to give rise to the sound.

If the Cavity contains fluid a sound similar to that of rubbing the valves in the mouth is produced.

M. Cruveilhier has arranged the sounds produced on percussion under nine heads, viz.: femoral, jejunal, caudal, pulmonal, intestinal, ostal, tympanitic, and hydatidic.

But Professor Bennett has greatly simplified this arrangement and has reduced them to three elementary sounds, viz. that produced on percussing an organ containing air, the most characteristic example of which is found in the empty stomach; 2nd that sound produced by the percussion of an organ containing fluid or in the distended bladder; and 3rd that produced from organs whose structure is composed of dense, uniform, parenchymatous tissue. The first he calls the tympanitic sound; the second the humoral, and the third the parenchymatous; and he considers the other sounds included in the arrangement of M. Cruveilhier as mere modifications of the above three elementary sounds. When once these sounds have been thoroughly and distinctly recognised the

operator may, by practice, render himself familiar with the intermediate sounds produced by the varying supposed conditions of the organ under examination

In addition to the variety and intensity of the sounds produced on percussion, attention must also be paid to the sense of resistance or tactile impression experienced when an organ is struck. This varies with the density of the organ: the lung presenting the greatest amount of tactile impression and the sounds diminished with it the least. The thorax of a child is elastic while that of an adult presents a much greater amount of resistance: but the elasticity and elasticity of the thorax depends to a great extent upon the density of the contained organs as well as upon the density of its own structure For instance, if a portion of the lung becomes impervious to air or compressed while the space is filled with serum the

Resistance at these points will be much greater than at those points of the curve which obtain their healthy condition.

On the other hand when the cavity is filled with air as in pneumothorax the resistance will be much less and the walls will react with more than normal elasticity. But it must be remembered that highly condensed air as well as fluid in a cavity will give rise to a comparatively great amount of resistance.

By allowing the hammer to rest for a moment after delivering the blow the sense of resistance will be much better judged of than by instantly removing it. Which ought to be done when the vibrations are to be judged of: for by allowing the hammer to rest the vibrations on which the clearness of the note depends will be checked.

Great attention ought to be paid to the sense of resistance as this often has as great diagnostic value as the note produced by

percussion.

"Auscultation."

In investigating the sounds originating in the interior of the body, more especially in the Circulatory and Respiratory organs, either the Stethoscope may be used or the ear applied directly to the part. More perhaps is heard by the direct application of the ear, but it is sometimes necessary to differentiate certain fine sounds, as in murmurs at the base of the heart when the Stethoscope will be found much superior.

The Stethoscope is only used as a means of Conducting sounds and establishing an uninterrupted line of Communication between the ear of the Operator and the body of the Patient. The form of the instrument is unimportant. So long as one end of it accurately fits the ear and the other rounded off so as not to cause pain when firmly pressed upon the skin of the patient.

Care ought to be taken that the mouth of the instrument is applied quite evenly and strong pressure should, as much as possible, be avoided for this causes pain to the patient as well as impedes the movements of respiration.

The best position for the patient will generally be found to be that in which the organ under examination is most easily accessible: the horizontal position for the front of the chest and abdomen and the sitting posture when the posterior part of the lungs is examined. In examining the posterior part of the lungs the arms ought to be crossed over the chest so that the scapulae are brought into the same plane and the space between them widened as much as possible. Care ought also to be taken that the patient is not thrown into a state of nervous agitation which tends to hurry the respiration and throws the heart into a state of irregular and irregular contraction.

Should due attention not be paid to this
grave error in diagnosis may be committed.

Before beginning the study of the various
sounds produced by diseased lungs it is
necessary to become acquainted with the
sounds heard in the healthy organ and
attention ought to be paid 1st to the nat-
-ural respirations marking particularly the
relative length of the inspiratory and expir-
-atory murmurs: 2nd to the modified respir-
-ation: and 3rd to the character of the voice
as heard through the chest. Combination of
'Vocal resonance' Having become thoroughly
acquainted with these any deviation from the
normal standard will be at once recognised.
In Examining the chest you ought to aus-
-cultate and percuss one exactly corresp-
-onding parts for "any deviation from the
normal condition observed in equal por-
-tion on both sides is of far less sig-
-nificance than the same deviation existi-
-ng only on one side"

"Auscultation of the Voice"

If the stethoscope be applied to the chest and the patient be desired to speak the resonance will be found to be transmitted through every part of the chest with a greater or less amount of intensity: we will find it to differ over the trachea, the larynx, the bronchi and the pulmonary tissue. If the instrument be placed over the trachea the voice will be heard with a much greater degree of intensity than when placed over the membranous walls of the bronchi for the firm cartilaginous walls of the trachea and its primary divisions conduct the sound much better than the thin elastic walls of the lesser bronchi and the latter better than the pulmonary tissue itself. The vocal resonance is heard very distinctly, through diffused, between the shoulders and over the root of the lung to which it is conducted by the large bronchi. These sounds become more diffuse and obscure as we proceed from the

apex to the base and in the lowest parts of the lungs are only recognised as a confused humming. In certain conditions of the lungs as when some part of it becomes impermeable to air the voice may be heard over other parts than those indicated. When the voice is thus heard it has always a certain Ventriloquous character and is termed Bronchophony. Bronchophony may also be heard when the smaller bronchi become dilated and in such cases the voice may be heard almost as plainly as at the larynx. In cases also when the thin membranous walls of the bronchi become thickened and solidified by deposit the necessary conditions for Consonance are present and the voice, acquiring as it were a new origin near the chest walls, is distinctly heard on stethoscopic auscultation. When the voice is so modified as to assume a vibratory, bleating character it is termed 'Egophony' The physical Conditions given are to this sound have not been clearly ascertained?

Laennec supposed it to be due to pressure upon the bronchi rendering them flat and like the mouth-piece of a hautboy. According to him also metallic tinkling and a sound resembling that produced on speaking into a jug may also accompany the voice. The former (Egophony) he considers as characteristic of hydatids who the pleura and states that it may be heard from the first to the third day but may continue for months when the disease is chronic. In these cases it may be taken as a favourable sign as it proves that the effusion is of small extent. Small portions of mucus becoming entangled in a bronchus may also give rise to this sound. It is also stated by Laennec that egophony never occurs in pleurisy under the following circumstances 1st: when the effusion of fluid is very copious and abundant: 2nd, when old adhesions obstruct the effusion of fluid into the pleura: and 3rd when there are false membranes without effusion in cases in which the effusion is abundant. as

soon as the expirable amount is absorbed reducing the Lungs of blood to the proper thinness Egophony may be heard. But this sound may occur without anatomical alteration for the thin translucent voice of aged people, in its transmission through the chest, often exactly resembles Egophony so that it is probable that Laennec has greatly over-rated its diagnostic value

The diagnostic significations of Bronchophony are expeditiously varied. Any thing tending to produce increased solidity of the pulmonary tissue or bronchial tubes may give rise to it. Of the diseases of which bronchophony is one of the physical signs may be mentioned pneumonia, tuberculosis, cancer, plastic exudations and effusions P. We require, therefore, to make a differential diagnosis between each of these conditions. Among the auxiliary means for establishing a diagnosis between one of these conditions may be mentioned that peculiar sensation experienced on placing the hands on the seat of solidification while the patient coughs or speaks. If the hands

be placed upon the chest of a healthy individual while he is speaking a slight "fremitus" of the chest walls will be felt. This is caused by the lungs being thrown into vibrations by the voice while these vibrations by immediate contact are imparted to the chest walls. If from any cause the lungs acquire an increased amount of solidity thereby intensifying their conducting powers, the fremitus acquires a similar increment of vigor, & thrown upon the chest walls with a force proportioned to the density of the consolidation. A weaker fremitus is observed in cases of pleuritic effusions for the fluid lying between the chest wall and the lung is not easily thrown into vibrations and consequently the vibrations are not thrown with such force upon the chest wall so that the fremitus upon the affected side will be weaker than that upon the healthy side.

The fremitus also varies in healthy subjects with the depth of bone of the voice: in

persons with a dark bass voice the fremitus will be much stronger than in those who have high set weak voices.

Auscultation may also be practised on the patient while he is coughing. No particular sound is heard in the healthy lungs during coughing except that you have a louder respiratory murmur and the shock of the cough when the chest walls. With the lungs in a diseased state pretty much the same results are obtained from the combined cough sounds as from the voice alone. But it is always well to make the patient cough so as to determine whether any particular sound is permanent or not: for portions of mucus becoming lodged in the bronchi may give rise to abnormal sounds which instantly disappear on the patient coughing up the cause of them. When the Stethoscope is applied to the chest of a healthy person during coughing you experience besides the shock the sensation of a cavity

or air rushing through a large tube.
When the lungs from any cause become solidified these sensations are exaggerated not only at the trachea but also at the root of the lung and even in parts of the lung in which the bronchi are much enlarged. This has been called the "tubular or bronchial cough" In cases of phthisis with large excavations communicating with the bronchi the cough has well as the voice sounds are to "Pectoriloquy" & sometimes heard as loud as at the larynx only much more circumscribed and from its extent we may form a pretty accurate idea of the size of the cavity. The "Cavernous rattle" is also much more developed by the cough than by simple respiration. The "Cavernous cough" is also produced when cavities exist in the lung.
You may also be enabled to judge of the permeability of the pulmonary tissue, in cases where little respiratory murmur is heard by making the patient cough for then he is found to take a deep inspiration after which

or after the cough cottad air is forced into whatever of the tissue remains permeable

"Vesicular Respiration"

In listening over the posterior inferior lobes of the lungs or over any other part where the sound is distinctly audible you will hear two fine murmurs having a weak, dull character These are the respiratory murmurs and are caused by the alternate dilatation and contraction of the air cells and smaller bronchi. The first murmur is much more distinct and prolonged than the second or expiratory murmur which is so fine in its character that its existance has even been doubted by some; its duration in health, is also much shorter than the first having a relation in point of time as one is to five. These murmurs have been compared to the crackling of salt: to the sound produced by ~~the~~ P. P. but the best idea is obtained by frequently auscultating a healthy subject in whom the sound may be heard almost equally at all points of the chest but most distinctly at the

uppermost parts of the chest and the posterior base.
The respiratory murmur is loud in proportion to the
rapidity of the respirations. When the breath is
drawn in a dull and slow manner the murmur
is scarcely heard but when drawn fully, and deeply
the sound is quite distinct. When the vesi-
cular murmur is heard soft, sighing, and distinct
we may infer that no destruction of the air cells
or obstruction of the calibre of the bronchi, either
from distention or compression of their walls, exist,
and that they retain their contractility unimpaired.
Should the walls of the air cells and smaller
bronchi become less elastic than normal the
expiratory murmur will be prolonged: this
has been considered as characteristic of the presence
of tubercles in the lungs.
The ordinary dull vesicular murmur of the
adult assumes, in children, a more harsh and
energetic character, owing, probably, to the smaller
space in which the sounds are confined and
the thinner walls which separate the lungs
from the ear. This has been called "puerile" respi-
ration. It has a louder and rougher

character when it occurs in the adult which it sometimes does when a portion of the lung suddenly becomes impervious to air thereby throwing more work upon the healthy part. It also occurs when the bronchial mucous membrane becomes thickened and obstructs the passage of air. In the former instance the sound respiration has been called "Supplementary respiratory murmur". This breathing sometimes remains during the whole life of the individual and is met with in females and men of decidedly nervous temperament. In cases where bronchi traversing portions of solidified pulmonary tissue, maintain their communication with pervious air cells the respiratory murmur may like the voice become strengthened by consonants.

The only way by which we can recognise these forms normally strong respiratory murmur, as in asthma depending upon cardiac disease is by paying attention to their greater clearness and increased pitch and loudness.

But as the pitch of the voice is increased in old age, the isolated tubules of the lobule is not

of much value.

"Bronchial Respirations"

In the normal state of the lung bronchial respiration is only heard at the anterior and central parts of the neck, and during a forced expiration at the root of the lungs. In the healthy state it has a blowing character and is wholly an expiratory sound.

The vesicular murmur is sometimes much stronger than the bronchial sound and may in some cases give rise to a slight bronchial murmur. The bronchial murmur is caused by the air passing from a large space (the cells and smaller bronchi) into a smaller one (the large divisions of the bronchi and trachea). When from any cause (as for instance) the lung tissue becomes dense, forming as it were a sounding board, the bronchial murmur is heard at a greater distance from its origin and in parts where it does not normally exist.

Bronchial murmurs have therefore much the same significations as bronchophony.

We must be careful in examining over the rest of the lung that the normal bronchial murmur is not mistaken for the consonated bronchial sound present in solidification of the pulmonary tissue. The murmur also becomes altered in diseases attended with expectoration into the bronchi and trachea as in Comp P. in which last it has a much higher tone producing the "whistling Comical respiration" Sometimes the bronchial murmur is obscured by rales in which case it will be necessary to make the patient cough which will sometimes remove the cause of these and allow the murmur to be heard.

The Amphoric echo and metallic tinkling are developed under the same physical conditions as the sounds in succussion and are compared under the general conclusion indicated under that head.

Vesicular Rales, Crepitous rattles or Crepitations are sounds originating in the respiration and produce a sound like salt decrepitating in a basin over the fire or like the crackling

of boiled fat. The sound is also somewhat like that produced by taking a portion of hair and rubbing it between the fingers near the ear. The sounds usually accompany inspiration, often towards the end of it, and is produced by the bursting of minute bubbles in a fluid of nearly the same density as water.

Crepitations originating in the air cells and smaller bronchi, possessed as they everywhere do much the same calibre, will be proportionately fine and will only be heard when no sound of greater intensity or different character exists in the neighbourhood.

In pneumonia we usually have crepitations as a rule during the physical conditions necessary for its production are present in perfection. In pneumonic œdema crepitation takes place into the air cells without simultaneously filling the bronchi and these sounds the conditions for its development are almost invariably found at the first and last stages. Crepitations are also heard in bronchitis.

The "mucus rattle" is caused by the bursting of large sized bubbles, either simple, large and uniform in size or mixed with smaller ones and may be imitated by blowing bubbles with a pipe, in a fluid more or less viscid. These mucus rattles can only be produced in the larger bronchial tubes and in Cavities containing fluid. The rattle may be equal or unequal just as they are produced by the bursting of large bubbles or by large and small mixed. The fluid causing them may be either pus, mucus or blood and we have it taking place in pleurisy, pneumonia, hæmoptosis, pulmonary catarrh &c. Large expectations or mucus rattles are most usually found in mucus catarrh most usually when it runs in to bronchitis It takes place also in abscess of the lungs, sanguineous cachexia and in the softening of tuberculous masses. In these the crepitations are very large and abundant and are produced when you have cavernous respiration in which case it is called

"Gurgling or Cavernous rattle".

Under the head of Moist rattles may be included certain bubbling, whistling, and hissing murmurs. These sounds generally depend upon some impediment of a solid or fluid character, as in ulceration and tuberculization of the mucous membrane and give rise to sounds which resemble the cry of small birds &c. &c. Even in the healthy healthy condition of the lungs these sounds may be found, arising from accumulations of mucus, so that they, in themselves, possess but little diagnostic value.

A "crackling" sound like that produced by inflation of a dry bladder has been described by Laennec who considered it a pathognomonic sign of vesicular and tuberculous emphysema while other authors have described it as arising in connexion with inspired air cells alone: others again describe it as only occurring when a portion of the lung

is made use of in all diseased to the size of a pea or bean and communicated with a bowing

"Friction Sound." When the pleura becomes inflamed and the smooth, even surface becomes roughened by exudation the opposing surfaces may be heard gliding upon one another. Instead of gliding smoothly upon one another, as in health, they emit a sound more or less harsh according to the amount of exudation thrown out upon their surfaces. The sound may resemble the crackling of leather hurried or suspiry, grating character or may be so fine as hardly to be distinguished. If the hand be placed on the part affected a rubbing sensation is felt which sensation is also communicated to the Ear on auscultation. This may, in some cases, help to distinguish it from certain Rattle which so closely resemble it in character that they are apt to be mistaken for one another. The cause of this sound is generally exudation of lymph upon the pleural surfaces but in any case of pleurisy does not

furnish friction sounds. For either the plastic exudation is not sufficiently firm to cause a friction sound or the opposite surfaces of the pleurae may become widely separated by effusion of serum. The exudation may also become smooth and a sufficient fluid for the pleurae to glide up and down, be again established The sound is only heard in the first stage of pleurisy so long as the walls are in contact; but should they become adherent or separated the sound will disappear but again become audible when the serum has been absorbed.

"The Physical Signs of some of the principal diseases of the Lungs."

"Pneumonia." In pneumonia the auscultatory signs and the percussion note differ according to the stage at which it is examined.
In the first stage of the disease while the pulmonary tissue is only in a state of engorgement, being loaded with blood or bloody

Sirum the respiratory murmur is only found weakened and mixed up with the minute crepitations which are most distinctly heard at the end of inspiration. The extent over which the crepitations are heard will give us an idea of the extent of the engorgement.
The percussion note is but little altered and only becomes dull and obscure as the congestion extends and approaches the state of hepatization. Should the congestion remain and give rise to exudation the second stage, or that of hepatization, is established. In this stage the spongy character of the lung is quite lost, and it becomes hard and solid. If auscultation be now practised neither the vesicular murmur nor the minute crepitations are any longer perceptible. The sound on percussion is more or less completely dull in proportion to the depth from the surface and the solidity of the pulmonary tissue.
Bronchophony is more or less distinctly developed and is heard in all those parts

to which the vesicular murmur is absent. but
more particularly of the seat of the inflamat-
-ion be near the upper part of the organ
or in the neighbourhood of the root of the lung
When the inflammation has passed into
the third stage, or that of purulent infiltration, the former signs
remain and in addition large quantities of
expectorations are found when the sacs begin
to break up and become expectorated.
Circumscribed collections of matter in the
lung are rare but when they do occur
and are found into by the bronchiae
we have pectoriloquy whisper and cavernous
coughs. When the cavity is near the surface
we may have blowing respirations or ampho-
-ric breathing. It must be kept in
mind that the blowing respirations of dil-
-ated bronchial tubes is very like that of
a cavity. The resolution of an inflammation
is marked by the gradual return of
minute expectorations, mingled with, and
gradually superseded by the healthy vesicular

murmur. When the inflammation has gone on to gangrene of the lung much the same signs are produced as in inflammation so long as the gangrene is diffuse but should it be confined to a circumscribed space only the same signs will be produced as in abscess of the lung. The diagnosis will be easily made when the fetid Ammoniacal and dark color of the expectoration is taken into account.

Chronic pneumonia may occur as a sequel of the acute disease, giving rise to permanent induration of the pulmonary tissue which is apt to be mistaken for Consolidation the result of tuberculosis. The sound on percussion will be dull and the respiratory murmur wanting while bronchophony and bronchial respiration will also be present.

"Emphysema" Emphysema is of two kinds, viz., vesicular, and interlobular. In vesicular emphysema of the disease the thorax the chest assumes a rounded and

Cystic duct from. According to D. Gee.
- Here the disease is essentially a Compensatory dilatation of the air cells, implying that a portion of the lung tissue is non-expansible: here the disease giving rise to it may be bronchitis, asthma &c.
The physical signs of this disease are, exaggerated resonance on percussion where the vesicular murmur is heard but very indistinctly and, in some cases, is entirely absent in some parts. The absence of the murmur is very varying in its locality disappearing suddenly and again reappearing in places where, immediately before, it was entirely wanting. The indistinctness of the vesicular murmur, or its entire absence, is due to stagnation of the air in the dilated pulmonary air cells and also, in part, to the limited play of the chest walls. Interlobular emphysema is not diagnosed during life, by any certain signs.
According to Laennec this is characterised by "dry crepitous rattle, with great bubbles

occurring with scarcely any intermission".
"This rattle is also sometimes heard in vesicular emphysema and is probably produced by the rupture of some over distended vessels, but it is of rare occurrence and of short duration"
This crackling rattle, in interlobular emphysema, is often, he says, accompanied with sounds of "ascending friction" in expiration
These are not always present and require much practice to detect them.

The air cells as well as the areolar tissue of the lungs is apt to become filled with serous fluid constituting "Oedema of the Lungs" In this condition of the lungs the resonance of the chest is diminished, the respiratory murmur is not so well heard as normally, and subcrepitant rales are heard extending over the chest. These crepitations are more superficial and humid than in pneumonia, but in some cases the crepitations are scarcely distinguishable from those of the latter disease and a diagnosis can only

be made by taking into account the general symptoms of the respective disorders.

"Bronchitis" Bronchitis is one of the most common of the diseases of the chest and consists of inflammation of the lining membrane of the bronchial tubes. It may be acute or chronic; and may affect either the large tubes alone or the large and small may be both alike under its influence.

Both lungs may be affected or only a portion of one of them; usually the upper lobes. When the tubes undergo the changes peculiar to the disease they become narrowed in their calibre, and that irregularly, thus converting them into musical instruments of a wire and hissing, whistling, cooing and snoring sounds are produced according to the degree in which the calibre of the tube is diminished, and its diameter on each side of the obstruction. If auscultation be performed in the early stage of the disease two dry sounds will generally be heard, viz,

Ronchus and Sibilus, both of which indicate that the tubes have become narrowed and that their lining membrane has become dry.

The Ronchi, characterised by snoring, coarse & groaning sounds, have their origin in the larger bronchial tubes and is a symptom of no great urgency; the sybili on the other hand have their origin in the smaller tubes and betokens much more danger since it denotes that the smaller air tubes and vesicles are affected. Under the term Sybili may be arranged the various hissing, whistling, and wheezing sounds. After a time the mucous membrane begins to throw out a kind of tenacious mucus which constitutes the second stage of the disease.

If auscultation be now performed two very different sounds will be heard, viz., crepitant and small crepitations which have been called the moist sounds. These crepitations are caused by the bursting of numerous bubbles of air formed by the mixture of the air with the viscid mucus

thrown out upon the walls of the tubes.
When this takes place in the large tubes
large expectations are produced & when in the
small, small expectations. We have
therefore sybilic and small expectations, as
respectively, the dry and moist sounds of
the lesser tubes: sonchi and large exp-
-ectations as those of the large tubes.
The presence of sonchi cannot very mate-
-rially affect the respiratory murmur but
when present in a great degree and very
loud may prevent us hearing it.
But when the sonchus is produced by a
film of mucus partially obstructing the
tube it may get firmly wedged and
prevent the further entrance of air into
that portion of the pulmonary tissue which
it supplies: in this case the sonchus
and respiratory murmur will cease, on
account of the collapse of that part of the
lung. This phenomenon, however, is not
permanent and may in most cases be
removed by coughing. This by its trans-

-itoriness may be distinguished from the same condition produced by emphysema.

In the case of the sibilant noise, the mucous lining of the tubes becoming thickened the ordinary murmur of the air passing thro' them into the air cells may be converted into a hissing noise so that the morbid sound supersedes rather than masks the normal respiratory murmur.

On practising percussion no appreciable alteration of the resonance will, or should be discernable. Should the lungs, however, become acutely emphysematous the resonance will be increased: while on the other hand if a portion of the lung should become collapsed from plugging up of the bronchi or from pressure of an enlarged bronchial gland the percussion note will be dull.

Signs of dilatation of the Bronchi.

In some diseases accompanied by excessive

secretion from the mucous lining of the tubes and also characterized by much and especated Coughing, as in some cases of bronchitis and Whooping-Cough. Dilatation of the bronchial tubes takes place. We find very variety dilatation: Sometimes a single branch like an aneurism: sometimes a series of dilatations of the same tube: and at other times a uniform cylindrical dilatation of a Congeries of tubes. In other cases we have a globular expansion of the end of a tube the walls of which are in a state of atrophy.

If the dilatation takes place in the smaller tubes there will be sybilus and whizzing sounds with deficiency of the respiratory murmur: if in the larger there will be ronchus. The presence or absence of large and small crepitation will depend upon the amount of fluid present. Bronchial respiration will be present which when the dilatation is extensive will have a cavernous character

In the lungs unnatural tunics containing fluid the cancerous bubbling of phthisis will be exactly imitated. When the dilatations exist in the lower part of the lung they are apt to become completely filled with blood. which gravitates into them and causes the phenomena to disappear but which may again be distinctly heard on making the patient cough up the accumulated mucus. Bronchophony & bronchial breathing will be heard when the dilatations are uniform and general on the chest. If the dilatation of the bronchi causes compression and solidification of the tissue around them the percussion note will be dull.

"Phthisis Pulmonalis." During the first stage of phthisis - that in which the tubercles become developed in the lungs - the physical signs are usually only those of acute catarrh. If the tubercles be deposited in any considerable quantity

the percussion note will be dull more especially in the anterior and inferior semilunar regions when the morbid matter is finally first deposited: then will be heard tubular breathing and the act of expiration will be harsh and prolonged owing to the impaired elasticity of the pulmonary tissue. There may also be fine crepitations depending probably upon the congested condition of the mucous membrane of the capillary tubes. Harsh bronchial respiration and bronchophony may also be detected. In the case of miliary tubercles scattered over the lungs we will find no consolidation of tissue and they will only be detected by the general symptoms. In the second stage of the disease the tubercles increase both in number and in volume and their presence is marked by increased dullness on percussion: the respiratory murmur is diminished in proportion to the amount of the deposit which by pressing upon and obstructing the substance of the lung produces

marked dyspnoea. Diffuse bronchophony or resonance of the voice is more or less marked. The tubules now begin to soften and disintegrate when large crepitations will be heard which the diminished breathing upon the diseased lung will give rise to, much louder than in the healthy one. In the third stage the tubercles are eliminated from the lung leaving behind larger and smaller cavities. These cavities may be recognised by a dull gurgling sound due to the bubbling of air in the mucus or pus contained in them. This gurgling, as before mentioned, may be produced by the presence of mucus in dilated bronchi or by the existence of a circumscribed abscess of the lung. which conditions will only be diagnosed by the general symptoms. Should the cavity contain no mucus or pus we will have cavernous respiration developed: if the cavity be large amphoric resonance and pectoriloquy will be more or less distinct.

The character of the percussion will vary with the pitch of the pectoriloquy with, bronchi or gravel, clear or obscure, confusedly or distinctly articulate. The character of the cavity will also greatly modify the tone of the pectoriloquy. It will vary with the size, the smoothness or ruggedness and the quantity of liquid contained within it. The depth from the surface also modifies the tone as well as the pitch. If it consists of one or more compartments or if it be encysted or flattened.

The cavities percussion may either be dull or resonant. In cases where the cavity is surrounded with dense and solid wall the tone will be dull. When the cavity is very superficial percussion will sometimes elicit the "cracked pot sound."

A cavity the result of extraction of a cavity can only be diagnosed by the diminished respiratory murmur and in no case easily made out on account of the small space usually occupied by it.

"Pleurisy" The signs of pleurisy differ according as effusion has or has not taken place into the pleura. If we listen on the seat of inflammation before effusion has taken place we will hear the dry inflamed membranes, the pulmonary and costal pleura, rubbing against each other and producing an ascending and descending friction sound.

If, again, we place one hand over the affected part the characteristic thrill will be recognised. But the friction sound soon ceases: either the two surfaces become adherent or effusion of serum takes place separating the two surfaces more or less widely. This constitutes "hydrothorax" If auscultation and percussion be now performed the note will be found more or less flat and the dullness will vary in its situation with the position of the patient. If the effusion has been great enough to fill the whole cavity of the chest the dullness will extend over the whole of it. The dull sound is observed as soon as the fluid is effused in some little extent and will

first be noted at the inferior part of the lung affected being higher and higher as the effusion proceeds. The amount of this fluid may be pretty accurately determined by placing the patient in the upright position and percussing from above downwards till you come to the line of fluid which will be marked by increased dullness. Should obscure effusion exist in the pleura the effusion will be restrained within them bounds and will not therefore be able to gravitate to the base of the lung. The respiratory murmur is absent or diminished in proportion to the amount of fluid effused. While this is excessive the lung will be compressed backwards - flattened almost against the spinal Column - No vesicular murmur will be distinguishable but in its place bronchial respiration and bronchophony produced by the air passing into the bronchial tubes - the condensed lung and the layer of fluid acting as Conductors of sound.

Bronchophony may be accompanied by Egophony which is probably caused by

"the vapid undulations communicated to the effused fluid by the vibrations of the bronchi and condensed pulmonary tissue."

Skin cold & most profusely bedewed about the inferior angle of the scapula when the patient is in the upright position. Should the liquid effused a certain amount the sound disappears or merges into pure bronchophony. If the lung be so completely compressed against the spinal column as altogether to prevent the entrance of air the respiratory murmur on the healthy side will be much more distinct than normal constituting 'vesicle breathing'.

In effusion into the chest straight also to be observed that the mobility of the chest is diminished: the intercostal muscles bulging if the effusion be copious.

On measurement the diseased side will be found the largest and the infra-scapular region fuller than normal with the shoulder depressed. From some unexplained cause pleuritic effusion occurs most frequently

on the left side. After the effusion has become absorbed there generally remains for a longer or shorter time an increased dullness due to the formation of false membranes. which dullness sometimes remains during life.

"Pneumothorax." The physical signs of this disease vary according as it is complicated with effusion of fluid or fistulous communications between the lung and bronchi In simple uncomplicated pneumothorax the resonance on percussion is greatly exaggerated and there is a total absence of the respiratory murmur sounds except at the root of the lung. We sometimes find that the chest is dilated but this is not always the case. When a simple pneumothorax is converted into a hydro effusion the surrounding signs hold good and we have in addition dullness at those parts where the effusion exists. The dullness will shift its position according to the position of the patient — If the patient

be shaken it will give rise to a sense of fluctuation. When there is supposed to be fluid and serious effusion on opening between the bronchi and the pleura we will find in addition to all the preceding signs metallic tinkling and amphoric resonance.

Douglas Glendinning

March. 1865.