

This latter problem is one of considerable interest, but of much greater difficulty, and has not, as far as the writer is aware, been hitherto attempted.

The ideas which the author associates with the terms "absolute" and "effective" forces are by no means obvious; nor is the matter much elucidated by the remark that "the distinction between them is the same as that which is familiar in mechanical science between the weight to be raised and the power which raises it," inasmuch as there is no "mechanical" difference between the weights in equilibrium on any simple machine, except in magnitude. The application of the term "power" to one of these is a fertile source of erroneous ideas.

The only intelligible sense that can be assigned to these terms in relation to the heart is, that the absolute force is the sum of the forces of the individual fibres; while the effective force is the sum of the resolved portions of those forces which conspire to produce the contraction of the organ. It is obvious that the latter alone is susceptible of definite measurement.

The author has introduced considerations of velocity and resistance, which are wholly foreign to the problem proposed to be solved; and in particular, the introduction into his numerical results of a quantity representing the depth of a vessel, from an orifice in the bottom of which a fluid would flow into a vacuum with a velocity of 10 in. per second (the assumed velocity of the blood), is purely gratuitous.

The question at issue, although fruitlessly complicated by the author, is really a very simple one. If a vessel be attached to the lower end of a vertical tube, and both filled with fluid, then, according to a well-known hydrostatic law, the pressure against the internal surface of the vessel will be the weight of a column of the fluid, of which the height is that of the fluid in the tube, and the base an area equal to that of the internal surface of the vessel. If these data can be estimated with sufficient accuracy in man, a reliable result may be immediately obtained; and the following means are suggested for arriving at the data required.

The author infers the height of a column of fluid sustained by the pressure of the blood in a large artery in man, from the results obtained by Hales in the horse, sheep, and dog, but without assigning any reason for the particular number he has assumed: this height may, however, be obtained in suitable cases by direct experiment.

Let a bit of a thin vulcanised sheet of caoutchouc be tied over the mouth of a small glass funnel, and this connected by a flexible tube with a long vertical glass tube. If the mouth of the funnel be placed over any superficially projecting aneurism (the more superficial the better), the convex surface of the aneurism will bulge inwards the membrane; but if a column of water equivalent to the internal pressure in the sac be poured into the tube, a compression of the aneurism will be maintained, which may be observed through the side of the funnel, by the elastic membrane being kept flat, or slightly convex.

The required superficial area of the ventricle may be thus obtained: Let a cast of its cavity be taken in plaster of Paris; then take a slip of gummed paper one inch broad, and say 18 inches long; cover the surface of the cast accurately with pieces cut from this paper, moistened, and stuck on. Then the difference between the whole length and that of the remainder will give the number of square inches of surface required.

The product thus obtained will obviously represent the initial force only; but it being the result of experiment that the hæmastic column remains nearly constant, it is presumable that the diminished force, as contraction progresses, is nearly proportional to the diminished surface on which it acts, and thus the effective force would be maintained nearly equal during the systole.

The author does not appear to fully appreciate the mechanism of the capillaries. He says that, "in many of them not more than a single blood-corpuscule can pass at a time." It has been with the writer the result of frequent microscopic examination, that in each species of animals the normal diameter of the capillaries is *invariable*, and is such that the corpuscles can just pass easily in single file. The obvious scope of this arrangement is to prevent the jamming which a small increase of diameter would permit.

Fitzroy-square, June, 1869.

CASE OF SPINAL APOPLEXY.

By ROBERT JACKSON, M.D.,

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ON Sunday, the 2nd May, 1869, Miss F. L——, a bright, merry, healthy, and well-developed young lady, aged fourteen, arose as usual, but while dressing said her "fingers felt weak." She, however, went to church both morning and evening, and seemed quite well.

On Monday she again got up as usual, but complained of the same "weak feeling" in her hands. Otherwise she felt very well; participated in the usual studies of the day; and in the evening had a warm bath, enjoyed it, and got into it "with the use of all her limbs."

On Tuesday she was much the same. Ate a good breakfast, feeding herself, &c. During the forenoon, however, the weak feeling considerably increased, and I was sent for. I found her lying on her back in bed, quite merry, laughing, free from all pain, and rather amused than otherwise at her condition. She was, however, unable to shake hands with me, or to move her arms except at the wrists; and failed altogether to pick up a pin placed on a book before her.

On Wednesday there was no very material alteration. I observed, however, that the intercostal muscles were not acting quite freely; she seemed, too, to lie *heavier* in her bed, and she evidently was more unable to turn herself round. There was also a moist crepitant rale over all the chest, with a little cough. The secretions continued free, the pulse regular; and she ate, being fed, a good dinner of roast beef.

On Thursday Sir William Jenner kindly saw her with me. Her general condition was not greatly altered: every sensation perfect; no anæsthesia; and she displayed her usual quick perception and intelligence. A careful examination, however, at this time clearly demonstrated a great and decided loss of power in all the voluntary muscles of respiration, and in those muscles of the arms, back, and chest, supplied by the branches of the cervical nerves. The diaphragm, too, was becoming fixed, and there was slight lividity about the cheeks, with a fall in the natural temperature.

From these symptoms it became evident there was some serious spinal lesion, implicating probably, and more particularly, the anterior branches of the cervical nerves and the origin of the phrenics.

Sir W. Jenner, therefore, diagnosed, and, as will be seen, with perfect accuracy, a clot in the cervical portion of the spinal cord, and he prognosed, notwithstanding the bright eye and still merry laugh, a speedy and fatal result. This took place thirty hours afterwards, without pain, without loss of consciousness or sensation, but only as the cessation of the power of respiration became more and more determined, with a desire to be raised "higher and higher."

In this interesting case a post-mortem examination of the brain and spine was kindly allowed, and made forty hours after death. There was slight opacity of the dura mater in several places. Brain congested and soft. A softened spot and ill-defined clot in the cerebellum. The whole cervical portion of the spine, but particularly anteriorly and to the left side, was imbedded in an oblong clot of dark venous blood outside the membranes. The whole length of the cervical portion of the canal and dura mater were deeply tinged by the colour of the clot. The cervical nerves all passed through this effused blood, the intervertebral canals on both sides being filled with it. So soon as the seventh cervical vertebra was reached the clot ceased, and the cord and canal assumed their normal condition and colour. There was also a good deal of semi-clotted blood about the pons, and the nerves arising from it.

It is certainly a matter of much difficulty to account satisfactorily for this great effusion of venous blood in a subject so young, and so apparently healthy and robust. No outward cause could be assigned; there had been no blow or injury, no illness, no interrupted function; but living with kind and affectionate relatives, she enjoyed every comfort and happiness. It might have been assumed that so great a lesion, situated in so important and vital a position, would

have given rise to more decided and graver symptoms from the beginning. The only probable explanation is, that the effusion took place very gradually, had room to extend itself, and coagulated slowly and imperfectly. Until the paralysis of the diaphragm, showing dangerous interference with the functions of the phrenic nerves, nearly every symptom might have been attributed to one or other of those obscure forms of hysteria so frequently met with in practice.

Notting-hill-square, Notting-hill, June, 1869.

A CASE OF ENCYSTED ABDOMINAL TUMOUR.

SPONTANEOUS RECOVERY.

By E. F. FUSSELL, M.B., M.R.C.P.,
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In a large number of abdominal tumours it is universally acknowledged that their true nature can only be determined by such precise tests as the knife of the surgeon, the successful efforts of nature to rid herself of that which is hurtful, or the evidence which a post-mortem reveals to the researches of the pathologist. The following case affords a remarkable example of the fact, that if these tumours be a stumbling-block to the ordinary physician, they are sometimes no less puzzling to those who have made them their especial study.

Mrs. P—, aged forty-two, married, with two children, consulted me in the early part of 1868 for a swelling at the upper part of the right iliac fossa. It was painless, about the size of an orange, and presented in its general features much the aspect of an hydatid or ovarian tumour. Catamenia irregular. Nothing abnormal could be felt per vaginam. In the course of six months it gradually increased, without any active symptoms, until it became as large as a child's head; it was much less defined, and less globular, than it was at first; rather tense; not absolutely dull to percussion. No fluctuation, and no solid body, could be detected. Uterus not enlarged.

She consulted a physician at Weston-super-Mare; and on her return the tumour had increased in size, and began to cause her much uneasiness. She said she was about to go into the London Hospital to be operated upon. To this I demurred, and requested a consultation with an authority in town, who pronounced it a "ventral hernia;" and she was directed to wear a graduated air compress. A few days afterwards a red spot appeared on the surface of the tumour, and in the course of a week she wrote—"The boil has broken, a quantity of yellowish-looking water has come away, and the swelling has vanished." To tactile examination there was only a fulness, and on her standing up but a slight bulging. From the minute opening I obtained a teaspoonful of thin sero-purulent fluid, which under the microscope exhibited some blood- and pus-corpuscles, but nothing else noteworthy. She subsequently saw a distinguished obstetrician in Edinburgh, who spoke of an injection, but afterwards determined to leave it alone. There was a slight oozing for several months. There is now a puckered cicatrix, and for a few inches in its neighbourhood the integuments feel thickened and hard. She has miscarried lately, but is at the present time (June, 1869) quite well.

What was the nature of this tumour? Besides the two diseases above-mentioned, it presented characters common to several others in its position, growth, dimensions, and phenomena discoverable prior to its bursting—e. g., psoas abscess, pelvic abscess, colloid cysts. Of the second of these a case is mentioned by Dr. McClintock, in which the swelling must have equalled, if not exceeded, that which I describe. Cystic disease of the kidney sometimes forms a tumour in front of the intestines, entirely confounding the diagnosis;* and the urine may be normal if the diseased kidney has ceased to secrete, and if the other is healthy. Colloid cysts may contain fluid of the utmost diversity in thickness, and be mistaken for ovarian tumours.† Dr. Crawford‡ has pub-

lished a case of spontaneous cure of an ovarian cyst by the discharge of its contents through the abdominal wall. But of all the outlets by which ovarian tumours sometimes empty themselves, the external abdominal issue is, according to most authors, less often followed by a cure than when they escape by other channels. I am not even now prepared to state accurately the precise origin of the formation of the cystic tumour that I have related. It may have been an ovarian cyst which inflamed and suppurated, or a chronic abscess altogether confined to the abdominal parietes.

Brighton, June, 1869.

EFFECTS OF A PISTOL-SHOT FIRED CLOSE TO THE CHEST.

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A VERY interesting case, illustrating the effect produced by discharging a pistol loaded with a small bullet only, fired close to the body, occurred in the person of W. B. Kendall, a man forty-three years of age, who committed suicide by shooting himself, and was found dead in his house in Lancaster on the 3rd of June, 1869.

When found, he was lying on his right side on the floor of the kitchen of his house.* There was a large pool of blood near him; and a pistol that had been recently discharged, having an exploded percussion cap on the nipple, was lying at his feet. The fingers of his right hand were blackened as if from the explosion of gunpowder. He was dressed in his usual clothing, was quite dead, and rigor mortis established.

I saw the body on the following morning, and found that there was a large hole in his coat, waistcoat, shirt, and under-shirt on the left side. The margins of the holes were scorched and ragged, and some of his clothes were saturated with blood. There was also an aperture in the wall of the chest sufficiently large to allow me to pass my hand freely into the thoracic cavity. When the body had been stripped, this wound was found to be circular in shape, and nearly 3 in. in diameter; portions, about 2½ in. in length, of the fourth and fifth ribs, at about 3 in. from the sternum, on the left side, were in fragments, and carried into the chest. The margin of the wound was burnt, ragged, and slightly inverted. The inversion may, however, have been caused by the hands of several medical men having been introduced into the wound. On opening the chest, the heart was found to be intact, and situated nearer to the right side than its normal position. The left lung was completely shattered; and in its substance were several fragments of bone from the broken ribs, and pieces of cloth from his apparel. There was no aperture of exit, and for some time I failed to detect any shot or ball; but, on continuing my examination, I discovered a small leaden bullet, measuring about three-eighths of an inch in diameter, and weighing a drachm and a half (72 to the lb.), impacted in the substance of the left side of the fourth dorsal vertebra and head of the corresponding rib.

This case will be of importance to the medical jurist from showing the great extent of injury that may be inflicted with a pistol loaded with powder alone; I say powder alone, for a bullet so small as the one discovered could not inflict more than a comparatively small amount of the injury that the deceased received. I have no doubt but that the demolition of the chest-wall, covered with several thicknesses of clothing, to the extent of a circle nearly nine inches in circumference, the fragmentation of the ribs, and shattering of the lung, are entirely due to the muzzle of the pistol having been pressed closely to the chest; for had the injury been produced by the bullet alone, a small opening of little more than a quarter of an inch in diameter would have been the result; at the utmost one rib only would have been fractured. From the fact, however, that the centre of the opening corresponded with the intercostal space, I am inclined

* I am aware that the position in which I have stated the deceased to have been found differs from that given in evidence at the coroner's inquest, but have reliable testimony from the person who moved the body as to its position before it was seen by the police authorities.

* THE LANCET, March, 1865.

† St. George's Pathological Catalogue, p. 541.

‡ Medical Times and Gazette, March, 1867.