SPOLIA OPIMA.

BEING THE PRESIDENTIAL ADDRESS TO THE SURGICAL SECTION, ROYAL SOCIETY OF MEDICINE.

BY

SIR JOHN BLAND-SUTTON, F.R.C.S.

On an idle day, in a fit of curiosity, a friend of mine took a Babylonian tablet of baked clay, beset with arrow-headed, or cuneiform, characters, to the British Museum and asked for a translation. The inscription proved to be a contract for the sale of grain, about 2000 B.C. The air of London had a bad effect on the tablet, for it cracked and disclosed another within—a compact tablet with an inscription in Sumerian, the early language of Babylonia. Professor Leonard W. King deciphered this as recording a receipt of grain, the inscription on the case being a shorter version of the deed.

I propose to set before you some examples of characters written by disease on the tissues of men that are as obvious to the eye as cuneiform writing, but more difficult to decipher. The first is a tumour in the shaft of the humerus which was brought before this Section in 1912

FIG. 1.—Lower portion of a humerus in longitudinal section; it contains a central tumour. The figure on the left shows the corresponding section of a normal humerus. (From *Tumours*.)

I am able now to give the complete clinical history of what appears to me to be a remarkable tumour.

A REMARKABLE TUMOUR.

General Adrenal Malignancy.

It is part of the duty of the doctor on a fashionable liner to look after the amusement as well as the health of the passengers. Dr. C., aged 45, had been a ship's doctor for many years. One evening, in the Red Sea, he was dancing with a fat woman, and, as so often happens on board ship, drawing-room lancers became kitchen lancers, and whilst swinging round his heavy partner he felt a sudden pain in the right elbow. A year later he noticed a swelling at the lower end of the humerus and a radiograph indicated the presence of a central tumour. On September 23rd, 1912, I excised the lower half of the humerus, for it was occupied with a red and extremely vascular tumour presenting the naked-eye appearances of a myeloma (Fig. 1). The microscopic characters of the tumour, however, were undecipherable, and I contented myself with a provisional label and styled it an endothelioma, as this name seemed to fit in best with its minute structure (Fig. 2). After all, the essential use of a name is to serve as a label. The patient recovered with a useful hand in spite of the removal of such a long piece of the humerus. With the help of an elastic bandage he could fix the forearm to the arm, and this enabled him to write letters and legible prescriptions, see patients, pocket fees, light a pipe, button his clothes, and, among other things, apply midwifery forceps success-

C

fully, and thus get a living. Indeed, the hand was more useful than any cunning contrivance made by man. Dr. C. led an active and useful life till 1918, when he was attacked by pains in the lower limbs, which he thought were due to secondary deposits in the spine. I was not satisfied about this and kept him under observation in the hospital. Some improvement followed, and I could find no evidence of recurrence or dissemination. A few days after admission the patient died suddenly.

The *post-mortem* examination revealed an extraordinary state of things. Both adrenals were converted into plum-coloured masses as big as fists (Fig. 3). The lower half of the right kidney was converted into a plum-coloured tumour. The abdominal lymph nodes were as big as ripe grapes and dull red. The heart was much larger than normal and the walls of the left ventricle were double the normal thickness. A nodule, in shape and size like a nut, projected from the interventricular wall among the cords of the mitral valve. The spinal cord was free from pressure and the spine from deposits. The lungs were free from nodules. The microscopic structure of the visceral tumours has been carefully investigated. The tumours in the adrenals and kidney exhibit the same peculiar structure as that in the humerus. Each consists of an enormous number of thin-walled blood vessels, and resembles a cavernous naevus. The nodule from the heart

FIG. 2.—Microscopic features of the central tumour of the humerus represented in Fig. 1. (From *Tumours*.)

throws much light on the nature of the case; for it has the same structure as the zona fasciculata of the normal adrenal, and is, in fact, a hypernephroma.

With the complete history of the case before us I venture to think that it may be read in this way: the primary tumour arose in the adrenal, and the central tumour in the humerus was secondary, the remarkable feature in the case was its chronicity. It is worth while pointing out that the pathological features presented by it are similar to those that characterize the rare condition known as general thyroid malignancy in which a moderate, and apparently benign, enlargement of the thyroid gland is associated with multiple tumours, especially in bones. The structure of such deposits is indistinguishable from that of normal thyroid tissue. I submit that it is a fair estimate of the case now presented to regard it as an example of general adrenal malignancy.

Perhaps the publication of this case may induce members to bring before the Section like or similar specimens. Moreover, I do not know of any published case in which the lower half of the humerus has been successfully excised for a central tumour.

A RARE ANGIOMA.

A shipping clerk, aged 25, came under my care at the Middlesex Hospital, in 1917, for a peculiar abnormality of the blood vessels of the right upper limb. The arteries and the superficial veins were enormously enlarged. The veins pulsated like arteries and a thrill was perceptible in

[3022]

all the veins. On auscultation a loud buzzing could be heard in these swollen vessels. The palm was occupied by a large blue compressible swelling with all the

FIG. 3.—Right adrenal and kidney in section. The adrenal is converted into a tumour.

characters of a cavernous angioma; it bulged through the first interosseous space and appeared on the back of the hand. The heart and big vessels of the thorax appeared to be normal.

The man said the swelling had existed as long as he could remember, but the blood vessels had of late increased in size. As he could use his hand and fingers freely I did not feel disposed to interfere, but warned him to return on the appearance of any serious change.

Six months later I found the man in my ward in a pitiable condition, ill and suffering. The fourth and fifth fingers of the right hand were gangrenous and bleeding. After careful consideration and consultation with my colleagues, I reluctantly amputated the limb just below the insertion of the deltoid muscle.

Immediately after removal the vessels were thoroughly irrigated with warm saline solution and filled with wax, coloured with vermilion, and subsequently dissected (Fig. 4).

The first surprise came with the injection, for the wax injected into the brachial artery promptly returned by the veins; both sets of vessels were filled with injection mass from the brachial artery.

An examination of the dissected specimen explains this. The brachial artery, more than twice the normal size, divides at the bend of the elbow into an ulnar and radial branch; each is as big as the common femoral artery.

The ulnar, the larger of the two, runs its normal course, and forms a superficial palmar arch consisting of a big moniliform artery sending branches to feed a cavernous

FIG. 4.—Large cavernous angioma of the palm. R.A., Radial artery; U.A., ulnar artery. The effect of impaired nutrition is shown by the transverse ridges on the nail of the fourth finger.

angioma in the skin of the palm. Superficial veins arose from the angioma and passed up the forearm as usual, but they were unusually big. Through this communication much of the injection material reached the veins.

The radial artery ran a normal course, but formed a tortuous rete mainly in the first interosseous space. Several large veins arose in this plexus. The interosseous arteries in the forearm are larger than usual, and the superficial palmar arch does not join the radial in the first interosseous space. The venae comites of the radial, ulnar, and brachial arteries are not enlarged. All the vessels concerned in supplying and discharging blood from the angioma had walls of the same thickness. During life these arteries and veins pulsated synchronously. They buzzed or purred with the same note and thrilled equally. The big angioma in the palm exercised the same effect on them as a varicose aneurysm. The blood during life was of the same colour in the arteries as in the veins; not so bright as arterial blood, nor so blue as is usual in the superficial veins of the forearm. The veins and arteries are alike in structure; there is no sharp distinction between the coats,

and elastic tissue is deficient in quantity.

A similar specimen in the Museum of the Charing Cross Hospital was described by R. Barwell in 1887; as he could find no term in textbooks to fit the abnormal condition of

FIG. 5.—Portion of a stomach showing an ulcer, from a woman aged 22; the ulcer perforated.

the blood vessels, he invented one—*Macro-angiosis*. The abnormal condition of the blood vessels in this limb offers a suggestive theme for an imaginative mind.

PATHOLOGY FOLLOWS THE SCALPEL.

During the last forty years surgeons have been too busy developing the possibilities of abdominal surgery to find time for inquiring into the remote consequences of some of their acts. It is well to remember that occasionally an operation which promised much leaves the patient in an unhappy condition. This is occasionally true of operations on the stomach. Gastric surgery made little headway until Wölfler, in Billroth's Klinik at the K.K. allgemeines Krankenhaus, Vienna, in 1881, introduced gastro-enterostomy. As happens to almost every important advance in operative methods there followed a groping stage, then a period of extreme specialization when a few clever surgeons acquired a successful technique and vulgarized short-circuiting. Such efforts have made us better acquainted with the gross maladies of the stomach than all the efforts of morbid anatomists during the preceding century. *Pathology follows the scalpel.*

Most of us admire men who have the acumen to recognize in familiar plants and animals specific differences which their predecessors failed to detect. This is also true of pathological conditions. It is difficult to believe that a hundred years ago gastric ulcer was not distinguished from cancer of the stomach. Trousseau, in a clinical lecture published about 1860, said: "To Cruveilhier unquestionably belongs the merit of having first described the simple chronic ulcer of the stomach as a disease special in its nature, and quite distinct from cancer of the stomach, with which till then it had been confounded." In 1830 Cruveilhier described the condition, and five years later published some excellent illustrations of the lesion in his *Anatomie Pathologique*.

John Hunter recognized chronic ulcer of the stomach at least forty years before Cruveilhier's observation. The Museum of the Royal College of Surgeons of England contains an excellent example (Fig. 5).

FIG. 7.—Intracapsular fracture of the neck of the femur. (Museum, Middlesex Hospital.)

has destroyed a part of all the coats of the duodenum. This is the earliest record of a duodenal ulcer known to me.

BILOCULAR STOMACHS.

For many years bilocular stomachs were objects of interest in the dead-house and in the museum. Anatomists regarded a double stomach as an example of atavism—an attempted return to the multilocular stomach of ruminants. With the dawn of gastric surgery men recognized that double stomachs were common, and pro-

duced by disease. Morphology has no place in it. We all believe that bilocular human stomachs are due to the slow contraction of the gastric walls in the immediate vicinity of a chronic ulcer, but we are not unanimous as to the best method of dealing with it surgically.

Many examples under my care have been treated by joining a loop of jejunum to the proximal compartment of the double stomach. In three instances I have met with a stomach divided by a tubular isthmus so narrow that the desire to excise the isthmus and join the opposite halves of the stomach was irresistible. The narrowness of the isthmus is shown in Fig. 6.

FIG. 6.—The isthmus of a double stomach. Natural size.

The immediate results of the operation in each instance were excellent. The patients were women; they were able to take food freely and painlessly, and quickly increased in weight. Within a year their troubles returned, with all the symptoms of a contracted pylorus. In each instance I reopened the abdomen and found the stomach so contracted at the site of the junction that gastro-jejunostomy was necessary and successful. It seems as if the contraction at the site of the ulcer which originally divided the stomach continued after the excision of the isthmus. Now I perform gastro-jejunostomy as a routine operation for bilocular stomach. This is a matter which could be cleared up in a society like this; if surgeons would be willing to relate their experience and if possible exhibit specimens of bilocular stomachs that have been the subjects of operations, we could frame some rules to guide our successors.

PATHOLOGICAL SPECIMENS AS RECORDS.

The pathological museum is a valuable adjunct to the wards and indispensable to teachers of surgery. When I rearranged the specimens in the museum of the Middlesex Hospital in 1883 I found the upper half of a femur with an intracapsular fracture of its neck. It clearly belonged to an individual of about fifteen, for the epiphyses are present but ununited. Simple intracapsular fracture of the neck of the femur in boys or girls is, I think, an extremely rare accident. A boy aged 12 was playing a rough game in the

school yard with his school-mates when he felt acute pain in the right hip. A few days later he was admitted into my ward at the Middlesex Hospital, and an x-ray examination showed clearly an intracapsular fracture of the neck of the femur. The boy made a good recovery, and walks with a limp, which is disappearing under massage and judicious exercise. It is the only case of the kind that I have seen during life, and if the accident is not uncommon, the specimen represented in Figs. 7 and 8 may be certainly accounted rare. Senile femurs with broken necks abound in pathological museums, but I doubt if five examples obtained from boys or girls exist in all the museums of the United Kingdom.

FIG. 8.—Posterior view of the same bone.

SURGERY IN THE EIGHTEENTH CENTURY.

October 16th should be Lemuria for surgeons; they need not throw black beans behind them or avoid looking back.

Indeed, it is useful to look back; on this day, 1793, John Hunter died. He recognized the value of meetings arranged for the discussion of matters concerned with the progress of surgery. In 1783, when the lease of his house in Jermyn Street expired, he moved to Leicester Fields and built a museum between the house in Leicester Fields and the house in Castle Street. There were lecture-rooms, work-rooms, a dissecting-room, and a press-room, where his books were printed and published.

In 1785, a society known as the Lyceum Medicum was established under the patronage of John Hunter and Dr. Fordyce. The meetings were held at Hunter's house. Medical cases were discussed by the members, and the more instructive of the additions to the museum were exhibited at the meetings. Hunter slowly mounted the professional ladder, and in the last ten years of his life he had a big and lucrative practice. Passion for scientific work delays a young surgeon when making a practice, but it is a sure rock on which to build, and though practice may come slowly, it comes surely, and persists. Pathology was for Hunter the physiology of disease, but his pathology was mainly morbid anatomy based on the naked-eye study of the dead body. He studied critically the principles underlying the healing of wounds. This is necessary for surgeons. *If wounds did not heal the art of surgery could not flourish.*

It is difficult to realize, when we bear in mind the ignorance that persisted concerning the causes of disease in the eighteenth century, that surgery could hold its own. The surgeon's time was largely occupied in dealing with injuries, especially cuts, wounds, fractures, and their consequences. Head injuries received much attention. Hernia, a common and serious affection, was carefully studied, and especially the anatomy of hernial regions.

This is true of hydrocele. Astley Cooper, when attending Hunter's lectures, found the town divided in opinion on the best mode of performing operations for its relief. "So great was the difference of opinion among students from different hospitals that it was quite ridiculous to observe their warmth on the subject." *The spirit of the profession on vexed questions remains unchanged.*

The arrest of bleeding takes a foremost place in the work of surgeons. Although Paré acquired in the sixteenth century the simple notion of tying the cut end of an artery to stop bleeding, surgeons are still exercising their minds to find a good ligature material.

It was unreliable ligatures that caused so much difficulty in the operative treatment of popliteal aneurysm. In the eighteenth century the direct operative treatment of popliteal aneurysm was unsuccessful, "a circumstance which led some surgeons of great eminence to prefer amputation of the limb in all cases." Hunter erroneously believed that failure was due to disease of the arterial wall in the vicinity of the aneurysm. He made some experiments on the carotid and on the femoral artery of a dog which led him to believe that the common operation failed because the artery was tied near the sac, and the diseased condition of the arterial wall prevented the proper occlusion of the lumen of the vessel; on the separation of the ligature bleeding ensued and often killed the patient. This idea led him to tie the femoral at some distance from the sac, where the vessel was healthy. In December, 1785, Hunter tied the femoral artery near the middle of the thigh for the cure of a popliteal aneurysm. The patient, a coachman, recovered. Four ligatures were applied and they were gradually discharged some months after the operation (*London Medical Journal*, 1786, vii, 391). His contemporaries did not get good results from the ligature of an artery remote from the sac. A century later (1886) Sir William Savory reported on the popliteal aneurysms preserved in the London museums and came to the conclusion that ligature of the femoral artery is not an ideal method of dealing with popliteal aneurysm. He recommended a reconsideration of the question and a return to the pre-Hunterian operation. Lister solved the riddle. The cause of failure was sepsis. As soon as means were devised for making ligature material sterile and reliable, surgeons returned to the ancient method. Some boldly dissected out the sac. In 1888 Matas began to open the sacs of aneurysms and restore the canals of dilated arteries by infolding their walls. He inaugurated a new phase in the treatment of injured and disordered blood vessels.

Since Hunter's death much knowledge of the diseases

of arteries has been acquired; he had no idea of the baneful effects of syphilis on their walls. Pathologists slowly realized that in this extraordinary disease the inner and middle coats of arteries soften, and yielding to the pressure of the blood form dilatations—aneurysms. Veterinarians have long known that aneurysms of the anterior mesenteric artery of the horse and the ass are due to injuries inflicted on the wall of this vessel by the palisade worm, *Strongylus armatus*. The sexless larvae of this worm enter the blood stream and damage the walls of the artery by anchoring on the internal coat by their teeth. Vermineous aneurysms are well known as well as their relation to embolic colic in horses. Later it was discovered that emboli associated with septic endocarditis swarm with streptococci, and such clots, arrested in arteries, induce local infection of the arterial wall inducing the formation of aneurysms. Such are known as embolic aneurysms. Then came Schaudinn's brilliant discovery of the cause of syphilis, a microscopic parasite, the *Spirochaeta pallida*, a trypanosome. The inner and middle coats of the arteries are its favourite haunts. Then truly the eyes of surgeons were opened and the relation of syphilis to aneurysm was revealed.

Tumours.

The Hunterian specimens mounted to illustrate diseased action in the museum show that the founder's ideas of many pathological processes were very crude. Without histology the surgeon's knowledge of the nature of tumours was not much above that of the horse doctor. Indeed, the herdsman used similar names. Doctors, farriers, and shepherds talk of corns, warts, blains, wens, and blemishes. Such names as polypi, tubercles, caruncles, and hydatids confuse rather than instruct. The slaughter-house furnished Hunter with melanotic tumours in the udders of cows, the knacker's yard supplied pigmented tumours from the tails of grey horses; from travelling menageries he obtained tumours in wild animals; the graveyard yielded calcified fibroids and tumours of bones. Surgeons classified tumours by colour, consistence, and clinical characters. With so much ignorance of the pathology of tumours, surgery was not helpful in dealing with them. To-day we remove them with some measure of success, but the cause of cancer remains undetected, and our methods of treatment are more or less empirical.

Operative Surgery in the Eighteenth Century.

Operations in Hunter's time consisted of bleeding, opening abscesses, removing pieces of dead bone, tapping for dropsy, releasing strangulated hernias, trephining the skull for cranial injury, cutting for stone in the bladder, castration, Caesarean section, removing pendulous tumours and cancerous breasts, and amputating limbs. Hunter was also especially interested in transplanting teeth.

The mortality of operations from post-operative sepsis was enormous. As late as the middle of the nineteenth century the operating theatre in one London hospital was over the *post-mortem* room, and seams in the floor "opened wide." The suffering of patients during operations was indescribable. Surgeons in those days must have been men of rare courage to practise an art requiring so much self-control. Some were very dextrous. The description of an amputation performed by Liston in pre-anaesthetic days gives a good idea of surgical dexterity:

"He took a formidable knife, and, having a scalpel in readiness, thrust the knife pointwise through the thigh, and, cutting downwards and towards the surface, in a moment completed the flap. A second and similar cut, below the femur, made another flap, the two incisions were united at the sides, the scalpel passed rapidly round the bone, the muscles *en masse* drawn up, the saw taken . . . and the limb fell to the ground. The rapidity was truly miraculous . . . the limb was on and off in a wonderfully short space of time; and this operation demonstrated the manual dexterity which practice will enable a man to acquire, whether it be in amputating a limb or picking a pocket."

The post-operative sufferings of patients were often dreadful, and the risks great. There is a specimen in the Middlesex Hospital Museum which I often look at as exemplifying these risks. It is a portion of thigh bone with an ivory peg in it. Its history is very instructive. A middle-aged man, the captain of a whaler, broke his thigh in the South Seas. The sailors put the leg in splints.

Some months afterwards he was admitted into King's College Hospital with the fracture ununited. Sir William Fergusson rubbed the fragments together; subsequently he scarified them subcutaneously, and later inserted an ivory peg between them. No union followed, and Sir William amputated the limb. Secondary bleeding occurred after the flaps had partially healed, for which Mr. J. W. Hulke tied the superficial femoral artery. An aneurysm formed at the seat of ligature. The patient died a few months later. The specimen is not only instructive, but it is of historical interest.

Surgeons vainly imagined in the dawn of the twentieth century that they had seen the last of post-operative sepsis. Sir Charles Bell's water-colour sketches, recently exhibited in the museum, are vivid pictures of septic fungating gunshot wounds incurred at Waterloo. The present war has given surgeons an opportunity of testing their accuracy and witnessing similar horrors.

The large collection of pathological specimens illustrating war wounds, now lodged at the Royal College of Surgeons of England, should be utilized. If these preparations were systematically studied much that is useful could be co-ordinated, and this Section should be the medium for collecting some of the "choicest spoils" obtained by surgeons in London.

A REPORT ON TEMPORARY PEGS FOR AMPUTATION OF THE LOWER LIMB.

BY

W. A. CHAPPLE, M.D., M.P., MAJOR R.A.M.C.,

SURGICAL SPECIALIST, PAVILION GENERAL HOSPITAL, BRIGHTON;
MEDICAL ADVISOR TO THE PROVISIONAL LIMBS DEPARTMENT
OF THE JOINT WAR COMMITTEE, BRITISH RED CROSS
AND ORDER OF ST. JOHN.

It has been agreed by all authorities interested in the subject that during the interval elapsing between the healing of an amputation stump of the lower limb (or a near approach to healing) and the provision of a permanent artificial limb when the stump has shrunk to its permanent size, a man should wear some kind of temporary peg. The period of more or less rapid shrinking and re-shaping of the stump follows healing. Though the stump may appear to be following a normal course, however, the scar may become tender, or break down and ulcerate, or bulbous nerves may form, or spurs may develop; devitalized bone may, instead of recovering, necrose, or the atrophy and shrinking of the soft tissues may be so complete as to bring to the surface bony spurs or prominences that make the stump rebellious to a mechanical appliance.

A MODEL STUMP.

An ideal stump is one which most nearly conforms to nature's stump, the normal heel, and is capable of bearing without discomfort the whole weight of the body in normal locomotion. The characteristics of the normal heel are that it is dome-shaped, is covered with skin capable of hardening with use, is free from scar, and has a subcutaneous pad of fat honeycombed with connective tissue, which lies upon the periosteum covering the dome-shaped extremity of bone. Every surgeon aims at reproducing these conditions in the end of an amputation stump. He may fail, but the more nearly he approaches the more successful will be the result, and the more grateful his patient.

A MODEL BUCKET.

A well fitting boot on a normal foot suggests the characteristics of an ideal bucket. A boot should fit accurately the whole contour of the foot. It should be sufficiently tight to bear equally on every surface of contact, and should be sufficiently smooth on all its inner surfaces to permit of the slight amount of necessary friction in walking to take place between the sock and those smooth surfaces. If the inside of the boot is rough, the sock tends to cling to it, and the friction in movement is apt to take place between the sock and the skin. These characteristics are even more important when we have to deal with skin surfaces and bony prominences which are not meant by nature to submit to this pressure and friction. An ideal bucket will therefore have a smooth and almost

shiny inside surface, with a diaphragm so placed as to carry a maximum portion of the weight of the body on the end of the stump, and a rim so contrived and shaped as to carry the remaining portion of the body weight by coaptation to the appropriate bony surfaces, near the adjacent joint.

PEGS.

Various kinds of temporary pegs have been designed and made from time to time, with some attempt to conform to those conditions. A peg can be used even before the stump is quite healed. It rapidly shrinks and shapes the stump to its permanent size and form. It trains at the soonest possible moment the muscles that are to move the stump in locomotion. It tends to prevent stiffness from disuse of the adjacent joint. It picks out the weak spot in scar or bone or nerve that is destined to give way later to the pressure of the permanent limb; and it does this early and without waste of time, and with the scrapping of a limb that cost under 10s. instead of one that costs £15 or of a bucket that costs £4. It avoids the use of crutches, with their danger of crutch paralysis; the displacement of the centre of gravity of the body, and the unequal distribution of pressure on the joints of the sound limb. It frees the hands from the immobilization that crutches entail, and permits the man to get on with work or training. It provides a light domestic "slipper" after the man has his permanent limb, with which he can rest at home or in his garden, by throwing off his seven or eight pound limb and putting on one of one or two pounds. It supplies him with a spare for use if his permanent limb breaks down or requires to be repaired.

Various Designs.

It is admitted that the ideal peg has not yet been found, and a number of manufacturing depôts have been busily engaged in making and improving pegs for the past two years. The following is a brief description of the most popular. They may be divided into two classes: (1) Therapeutic pegs, and (2) Auxiliary pegs. The therapeutic peg is one which shrinks and shapes the stump, but has no durability for permanent use. The auxiliary peg is one which is serviceable to the wearer after the limb has approximated its permanent shape and size. It has the characteristics of permanence and may be used to fill the interval between more or less complete shrinking and the time when a permanent limb can be supplied. If well made and of durable material there is no reason why it should not act permanently as a spare, a rest, and a "slipper."

Plaster Pylon.

The most generally used peg of the therapeutic class is the plaster pylon. It is made of two wooden struts morticed into a turned wooden ferrule, to the bottom of which is fixed a rubber heel. These uprights are of unequal length for a thigh stump and of equal length for a leg stump. After the skin of the stump is smeared with vaseline, the upper ends of the struts are embraced in plaster-of-Paris bandages, which are wound round the stump. When a sufficient number of turns have been made to give the bucket stability, it is left for a few moments to harden, then slipped off and reinforced with more

Fig. 1.—Plaster pylons. P.P., Plaster-of-Paris bandages.

plaster bandages, the edges being turned over and shaped to conform to the bony prominences on which the body weight is carried. The inside is made perfectly smooth with plaster-of-Paris cream. It may be naturally or artificially dried, but it is usually hard within forty-eight hours from the time it is made and is ready for use. A hook is advisable in the outer strut for a thigh stump, and also a wooden spreader between the struts in order