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AND MECHANISM.

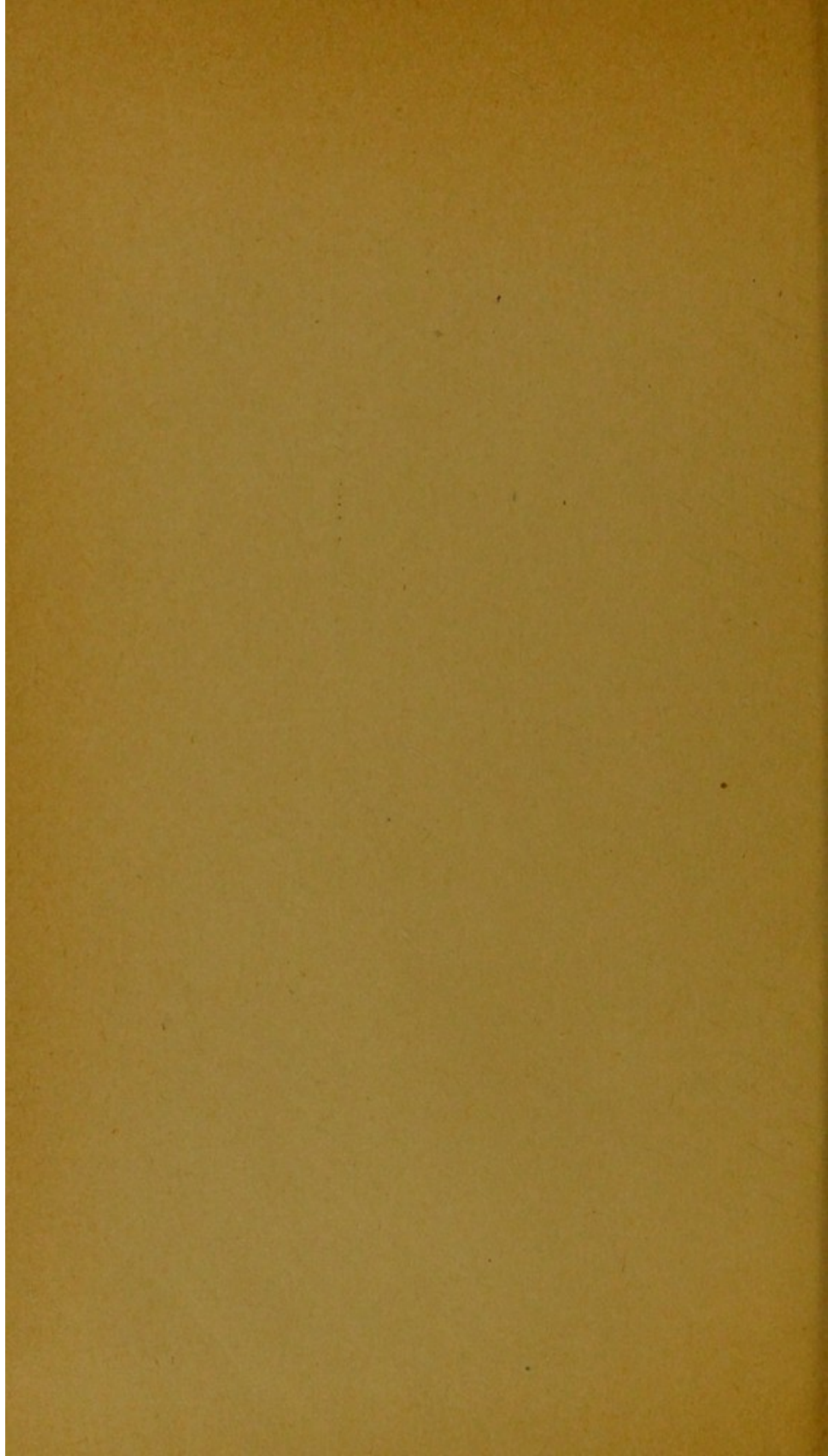
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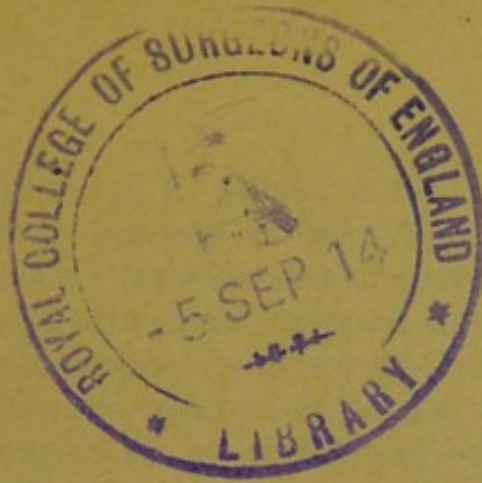
ADONIRAM B. JUDSON, M.D.,
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TRIGGER FINGER, ITS CAUSE AND MECHANISM.

BY ADONIRAM B. JUDSON, M.D.,

NEW YORK.

A PROFESSIONAL man, 76 years old, had an attack of arthritis in the fingers of both hands in June, 1913, with resulting trigger finger in the proximal phalangeal joint of the middle finger of the right hand, with swelling and deformity and stiffness of the joints of the middle and ring fingers. These results are still present. Motion past the right angle in either flexion or extension develops a painful snap, or jerk. This may be described as a momentary hesitation followed by a sudden acceleration. The jerk is more severe after the joint has been undisturbed for some time, and especially on waking in the morning. After it has been repeated a number of times for experiment or observation it is painless and comparatively slight. It is never entirely absent. When the hand is quiet there is no pain except what is felt in chronic arthritis on pressure or when motion is forced beyond the point of comfort. Many of the uses of the hand are interfered with. A pencil cannot be sharpened in the usual way by flexion and extension of the fingers. It also impedes writing and sewing. A woman thus

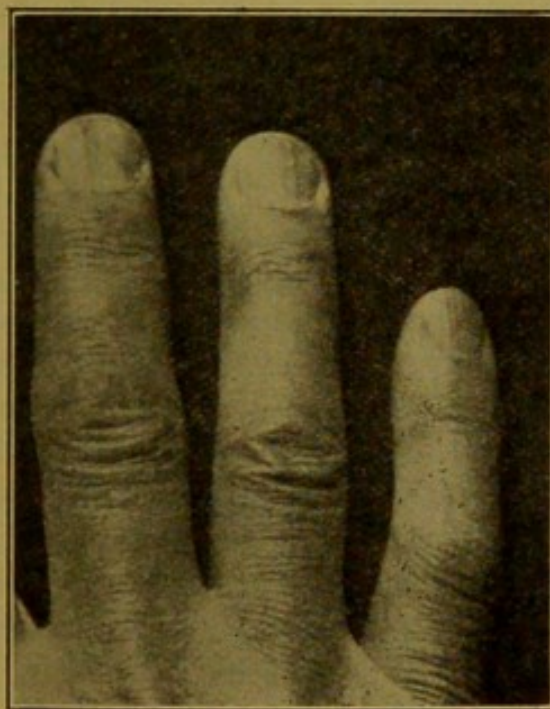
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affected said that a needle in her fingers seemed as large as a pencil. Other manual movements are at times brought to a sudden stop in a surprising, inconvenient, and more or less painful way. The momentary pain is sometimes very severe.

Cases of this kind have been occasionally reported and they have given rise to an extensive literature devoted largely to cause and mechanism. This leads to rather delicate ground. A recent writer withholds assent from certain theories declared by him to be "weird," and then proceeds to advocate one still more elusive and mysterious. Foreign writers also have developed decided differences of opinion. One declares that the presence of a node on a tendon cannot account for the peculiar action because no nodes are to be found, which leads another to remark that his predecessor did not know how to examine. It is necessary therefore to move carefully along this path. It may be stated incidentally that the sensation of a node moving with a tendon may be felt by pressing not only on the head of the third metacarpal bone but also on the lower end of the radius in the wrist.

The peculiar action of a trigger finger resembles that seen when a pocket knife is opened or shut. Movement is smooth till a square shoulder at the near end of the blade presents an obstacle which retards motion till a certain point is reached when motion is accelerated with a jerk. A counterpart of this obstacle may perhaps be found in a node on an articular surface where it would cause the halting, corduroy-road action of a trigger finger. In the construction of a knife, however, an important feature is present which is absent from the anatomy of the hand, and that is the strong steel spring concealed in the handle of the knife. It produces

positive pressure between the surfaces composing the metallic joint. If the spring were absent, or if its place were taken by a strip of some inert substance like cork there would be no jerk, and shutting and opening the knife would be perfectly smooth. While there is nothing very closely resembling a steel spring in the hand or forearm, still we may find a muscular action a force which



draws the surfaces together and creates a pressure comparable with that produced by the steel spring.

The fact that the digital joints are the only ones subject to this affection gives rise to the well-founded presumption that they have mechanical features found nowhere else. This is true. The digital joints are supreme. The rest of the upper extremity may be considered as preparing the way for the superlative functions of the hand. The

mobile shoulder blade, the circumduction of the shoulder joint, the provision for pronation and supination found in the forearm, the circumduction of the carpus, and the revolution of the first into opposition to the other digits, all these preparatory devices and processes culminate in the thumb and fingers which guide the pen and the scalpel. The matriculation ticket of an old-time medical teacher bore the picture of a human eye at the end of an index finger, *tactus eruditus*. These potent terminal members control the painter's brush, the sculptor's chisel, the notes and keys of the musician, and the tools of the skillful workman and ingenious inventor. They are slowly leading their fortunate owner into civilization.

The fingers require not only delicacy and swiftness but also strength. Small in bulk and weight, and far removed from the point of resistance in the inertia of the trunk, they still are endowed with great strength. Their power comes from important groups of muscular fibers assembled in the mass of the forearm. The long tendons of one set, the flexor sublimis, are inserted in the bases of the second phalanges. They make pressure on the articulating surfaces, especially those of the nearest joint, the affected one in the case here reported, pressure augmented by the pull coming from the other group, the flexor profundus, whose tendons pierce those of the sublimis to be inserted in the distal phalanges. These long tendons are bound to the phalanges by fibrous sheaths and as they lie close to the bones and parallel with them a large part of their force is expended in pressing the articular surfaces together, the residue being given to moving the joint.

Motion is doubtless impeded by intraarticular

irregularities in other parts of the body where joint surfaces are held in contact by the static resistance of circumarticular ligaments and to some degree by the dynamic influence of muscular contraction. No joints, however, but those of the digits are subject to the exceptionally great pressure of powerful muscles acting through tendons lying parallel to, and in close contact with, long bones. The strength of these muscles is shown by the unyielding grip exhibited by the hand in an emergency. It is clear that when digital muscles are in action they concentrate on small articular surfaces pressure as positive and distinct as that made by the steel spring of the pocket knife.

After witnessing the dissection of a normal hand, by the kindness of Dr. Gallaudet, it appeared to me that the node seen in the accompanying photograph of the affected hand, on the radial side of the base of the second phalanx of the middle finger, might extend into the joint where it would project as an obstacle on the palmar edge of the articular surface at the base of the phalanx. At this point it would be in apposition, when the joint is at a right angle, with the rounded lateral articulating condyle on the radial side of the head of the proximal phalanx. It is evident that when these two eminences, one abnormal and the other normal, pass each other, as they do when the joint traverses the right angle, they must, when pressed together by muscular contraction, experience a momentary hesitation followed by an acceleration of speed such as is seen in trigger finger. That there may be cases which do not have their origin in arthritis is suggested by the personal experiences and research of my friends, Drs. Weir and Abbe.

It is surmised that as the flexors are stronger

than the extensors the jerk of trigger finger would be more severe in flexion than in extension. This is found to be the case as a rule. And further, it is found that the jerk is lessened or absent when passive is substituted for active motion. These and other experiments are interesting and sustain my proposition to a certain extent, but they are wanting in scientific accuracy, and their results are not constant. Aside from these experimental observations, the presence of unusual pressure between the joint surfaces when voluntary motion is made by the fingers, and the probable presence of a node on one of the surfaces give sufficient warrant to the following proposition: In trigger finger an obstacle of arthritic origin on one of the articulating surfaces is surmounted with momentary hesitation followed by a jerk or sudden acceleration of speed, as the joint moves under the exceptional pressure which voluntary action interposes between the articular surfaces of the digital joints.

X-ray views have been taken in this case, but they fail to show any notable change in the bone. Ordinary inspection, however, shows swelling and deformity, with a projection, seen in the figure, on the radial side of the base of the second phalanx of the middle finger. The joint is $\frac{1}{8}$ inch wider at this point than its fellow of the other hand. Dissection would probably reveal surface irregularity. It is to be hoped, however, that an autopsy will not be proposed in the immediate future as the joint herein described is part of the still good right hand of the author.

There has been no local treatment except by a gutter splint of sheet aluminum applied with a single strip of adhesive plaster to keep the joint extended at night. At the end of the year the jerk

is less marked, but pain and stiffness continue and involve the metacarpophalangeal joint. Persistent catharsis has been maintained with oleum ricini, and as a result perhaps no other joint of the body has been attacked by the infection which is held to be the cause of chronic multiple arthritis, an affection intractable and not as yet well understood.

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