This invention has to do with portable adjustable manipulating apparatus and it is a general object of the invention to provide a simple, practical, easily operated apparatus that can be used to advantage for manipulation as, for instance, manipulation of a limb of a patient's body, and which is such that it can be easily and quickly adjusted to gain a satisfactory action.

There are various persons whose limbs require manipulation and since such action must be carried out smoothly and carefully it usually required the services of a masseuse.

It is a general object of this invention to provide a power driven machine that can be used to advantage in many situations where limbs are required to be manipulated, the mechanism being such that manipulation can be effected at spaced intervals of time and throughout suitable distances, to the end that safe and satisfactory action is gained.

A general object of this invention is to provide apparatus of the general character referred to which is of such general construction and arrangement of parts as to enable it to be used advantageously in connection with or adjoining a bed, or the like, on which a patient is located.

Another object of the invention is to provide a machine of the general character referred to in which a line is operated by a prime mover, as through a crank, and has a working end that depends and which can be advantageously coupled to a limb to be manipulated.

A further object of the invention is to provide a machine of the character referred to including means multiplying motion of the line as initially imparted by the crank, and further including means by which the movement of the working end of the line can be varied at will to gain the desired movement or stroke, while the working end of the line is attached to the limb of a patient.

The machine of the present invention is characterized by a U-shaped frame disposed on its side or horizontally, so that it has an elongate, horizontally disposed carriage, operable on a floor or the like, a standard projecting from one end of the carriage, and an arm projecting horizontally from the upper end of the standard to overtake the carriage. In a typical arrangement the carriage can be inserted beneath a bed so the standard projects upwardly at an edge or end of the bed, causing the arm to overhang the bed. The carriage has a housing or case portion in which a prime mover or motor is located, and the motor operates a crank, preferably through a variable speed reducing mechanism.

A line is provided to be operated by or from the crank and extends up at the standard and along the arm to the outer end portion thereof, where it has a working end. Guide means handles the line and preferably involves a lower guide pulley at the lower end of the standard, an upper guide pulley at the upper end of the standard, and an outer guide pulley at the outer end of the arm. A means is provided, preferably in the case, for multiplying the action imparted to the line from the crank, and in a preferred form this means involves a fixed pulley which may be on an axis coincidental with that of the lower guide pulley and a pair of pulleys on a crank pin carried by the crank arm. The line has a dead or fixed end and extends therefrom around one of the crank pulleys, then around the stationary pulley and then around the second crank pulley to pass therefrom to the guide pulley and then up through the standard.

A means is provided for effecting adjustment of the stroke of the line while the working end of the line is fastened to work on an object to be manipulated, as for instance a patient's limb. This adjusting means involves a crown block, means supporting the crown block in various positions vertically, a travelling block which is free to reciprocate vertically and normally tends to move downwardly or away from the crown block, a stop limiting movement of the travelling block toward the crown block, and a guide means supporting the blocks. The line extending up from the lower guide pulley passes over the crown block around the travelling block and continues up therefrom to the top guide pulley. The means provided for adjusting the position of the crown block involves a suspension member which may be a line carried on a drum, and the drum is rotated from a manual control at the exterior of the standard to a suitable drive which may involve a worm gear mechanism.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a side elevation of a typical embodiment of the invention, showing it in working relationship to a bed or cot carrying a patient having a limb requiring manipulation. Fig. 2 is an enlarged plan section taken as indicated by line 2-2 on Fig. 1. Fig. 3 is an enlarged vertical sectional view through the standard of the frame and showing the mechanism contained therein.
Fig. 4 is a view similar to Fig. 3 showing the parts in another working position, and Fig. 5 is an enlarged view of the mechanism in the upper portion of the standard, being a view taken as indicated by line 5—5 of Fig. 3.

The machine provided by this invention involves a U-shaped frame having or made up of a carriage A, a standard B, and an arm C. A prime mover is preferably in the form of a motor M, is carried by or located in the carrier A, and drives an operating line L which extends from the carrier to the outer end portion of the arm where it has a depending working portion. A suitable guide means D handles the line so that it extends upwardly through the standard B and then from the upper end portion of the standard to the outer end portion of the arm. A means, preferably in the nature of a pulley mechanism F, operates on the line, preferably at the carrier, to multiply motion in the line imparted thereto through action of the crank driven by the motor, the crank being a part of the crank mechanism G attached to the carrier, and a means H acts on the line, preferably as it passes upwardly through the standard of the frame, to vary the motion or stroke of the working end of the line.

The carriage A may, in practice, vary considerably in form and construction. In the preferred form the carriage involves an elongate flat horizontally disposed platform 10 provided with supporting wheels 11 and carrying a housing or case 12. In the arrangement illustrated there are four supporting wheels 11; one located at each corner of the platform and the housing 12 is a box-like structure of limited vertical extent and extending lengthwise of the platform from one end, which I will term its outer end. A suitable stop means is preferably provided for setting the platform against movement and in the drawings I have shown this as involving a pivoted arm 15 carried by the platform and having a shoe 16 engageable with a floor 17 or the like. A suitable spring operated releasable latching device 18 is provided for setting the platform once in position for use where the shoe 16 is pressurized for engagement with the floor. The carrier, as provided by the present invention, is such that it can be readily inserted beneath the rails 15 of a bed or cot having supporting ends 20. In the case illustrated the carriage is shown inserted under the bed from one end thereof, so that the arm C extends over the bed with the working end portion X of the line L in position to be engaged with a limb 22 of a patient located on the bed. In the particular case illustrated the working end of the line is shown directly coupled with the limb 22 by means of a suture and sling 23 attached to the line, whereas, if desired, suitable intermediate apparatus or attachments may be employed. As an example of such an attachment I show a rocker arm 24 pivotally carried by a collar 25 adjustable along a standard and having a multiplicity of spaced openings 26 which can be employed, if necessary, for carrying slings or other devices that may be used in gaining the desired action by means of the present structure. In Fig. 1 of the drawings the arm 24 is shown hooked out of service so that it does not interfere with the free and proper operation of the line in a case where the working end of the line is employed directly.

The standard B is an elongate tubular part, preferably round in cross section and of such length as to extend upwardly from the carriage to a point a suitable distance above the top of the bed. In the case illustrated the standard is engaged with and projects upwardly from the housing 12 and joins the housing at the outer end thereof. With this arrangement the standard can be located adjacent the bed while a portion of the housing and a substantial amount of the platform 10 extend under the bed.

The arm C is an elongate rigid element that extends upwardly through the standard B so that it can be adjusted horizontally relative to the standard to project various distances therefrom. In the case illustrated the arm is slidably carried in a guide 30 at the upper end of the standard and it can be releasably secured or clamped in a selected position by means of a set or clamp screw 31. In the form of the invention illustrated the arm C is adjustable or variable as to length, it being formed of an outer tubular section 32 and an inner section 34 which slides in or has telescoping engagement with the section 32. The arm sections can be set in an adjusted position or relationship by a set or clamp screw 35 carried by section 33 and adapted to clamp against section 34.

Through the mechanism just described the arm can be readily adjusted or varied so that its outer end occurs over the bed at any desired position.

The motor M provided in the housing 12 may be a suitable electric motor supplied through a power line 40 and connected so that it is under control of a suitable switch 41 accessible at the exterior of the housing. In accordance with the present invention the motor drives a crank shaft 41 through a variable speed reducing mechanism 42, which mechanism has a manual control member 44 at the exterior of the housing where it is readily accessible and which is such that it can be operated to effect any desired speed ratio between the shaft of the motor M and the crank shaft 41. The crank shaft 41 which is an element of the means G, carries a crank arm 45 at the outer end portion of which there is a crank pin 46.

The line L is preferably a single continuous line extending from the carriage A where it is operated by the crank mechanism G upward through the standard B and then substantially horizontally therefrom to the outer end of the arm C where it has the working portion X. The guide means that handles the line preferably involves a lower guide pulley 50 on a fixed axis in the housing 12 below the lower end of the standard B, an upper guide pulley 52 in the upper end portion of the standard, and an outer guide pulley 53 at the outer end of the arm C. Through this general arrangement of the line it is handled or strung between the carriage A and the outer end of the arm so that the only exposed portion of the line occurs between the upper end portion of the standard and the outer end of the arm, which portion of the line is so related to the arm and elevated that it does not in any way complicate the apparatus nor present a hazard.

The means F handles the line L in the housing 12 and serves to multiply the action of the crank mechanism so that it has an equivalent motion of a limited size or stroke can be employed to give the line L a substantial movement or stroke. In the case illustrated the means F is a pulley mechanism involving a fixed pulley 60 which is preferably on an axis or shaft 61 common with the
guide pulley 50, a first crank pulley 62 which is carried by the crank pin 46, and a second crank pulley 63, likewise carried by the crank pin 48. The line L has a dead or fixed end portion 70 anchored or fixed to the carriage at 71a within the housing 12. In accordance with the present invention the line extends from the fixed point 71 around the first crank pulley 62, then around the fixed pulley 60, then around the second crank pulley 63, and then to the guide pulley 50. With this construction, as the crank operates or turns the space between the pulleys 60 and 62 and the pulleys 62 and 63 varies, depending upon the throw or stroke of the crank, and it will be apparent that as the crank operates the portion of the line issuing upwardly from the guide pulley 50 acts through a distance or stroke considerably greater than that which would be occasioned if the line were directly engaged with the crank.

The means H provided to engage the line and adjust or vary the motion thereof is preferably located within the standard B so that it is housed thereby, and in the preferred form of the invention it involves a crown block 65, a traveling block 66, guide means 67 supporting the blocks for vertical movement, means 68 supporting the crown block in a selected position vertically, and a stop 69 limiting movement of the traveling block upwardly toward the crown block.

The guide or guide means 67 is preferably in the form of a vertical post 70 suitably mounted in the standard B, as shown throughout the drawings. The traveling block 66 is shown as involving a body or slide 71 slidably carried on the guide post 70 and carrying a pulley 72 to be engaged by the line L. The stop 69 is shown as a stop collar set in the desired position on the guide post 70 by a set screw 73. In accordance with the invention the traveling block normally tends to move downwardly and thus keeps slack out of the line. In the case illustrated a weight 75 is provided on or incorporated with the slide 71 so that gravity serves to normally urge the traveling block downwardly. The crown block 65 is provided with a body or slide 80 slidably carried on the post 70 and has a pulley 81 supported by the slide and engageable by the line. In the preferred arrangement, the line extending upwardly from the lower guide pulley 50 is passed over the pulley 81 of the crown block and extends downwardly therefrom and around the pulley 72 of the traveling block whence it extends up and passes over the top guide pulley 52.

The means 68 supporting the crown block 65 is such as to support the crown block in various positions along or vertically of the post 70, thereby varying the spacing of the blocks as, for instance, when the traveling block is engaged with the stop, as shown in Fig. 5. The means 68, as shown in the drawings, involves a supporting line 85 depending from a rotatable drum 86 arranged in the upper end portion of the standard. The drum is carried on a shaft 87 which is rotatable from a manually operated hand wheel 88 at the exterior of the standard. In the preferred form of the invention the drive between the hand wheel and the drum shaft 87 is through a worm gear mechanism 89 which serves to hold the drum shaft against operation in either direction unless deliberately operated, as through operation of the hand wheel. By rotating the drum 86 the suspension or supporting line 85 that depends from the drum to the slide of the crown block can be operated to support the crown block in any desired position.

In employing the machine of the present invention the depending working end X of the line is connected directly or indirectly with the working parts, as for instance, with a limb which is to be manipulated. In a typical situation the line can be connected or coupled to the work that when the crank is positioned as indicated in Figs. 1 and 2 the traveling block of means H is spaced well below the stop 69 as indicated in Fig. 1. The traveling block, in such case, is supported in a down or lowered position and when the machine is put into operation the work moves over or around the blocks of means H, causing elevation of the traveling block without moving the work, though some pressure is exerted thereon by reason of the weight of the traveling block. When the traveling block finally reaches the stop it stops its travel and the line upward of or beyond the means H is operated, causing elevation of the working end portion X and consequent movement of the work. By variation or adjustment of the position of the crown block of means H the stroke or movement of the working end portion X of the line can be varied. From the foregoing description it will be apparent that the action may vary through a wide range, that is, from a very limited or short stroke to a long stroke. Through the construction provided by the present invention the line L being engaged over two sets of pulleys, or through two pulley mechanisms, as at means P and means H, is of substantial length and if formed of a material having some yield or stretch, the action gained at the working end of the line is somewhat softened or cushioned, whereby a limb 22 or the like can be moved gently, or without sudden shock or severe force that might otherwise cause injury or discomfort.

I, may, if desired, provide indicating means I at the upper end of the standard B to indicate the movement of the working end of the link. The indicating means I, as shown, involves a shaft 90 rotatably carried by the body and extending through the body to carry an indicator 91 on the exterior thereof. A segment 92 is carried by the shaft 90 within the body and is engaged with a pinion 93 on the end of the shaft 87. When the shaft 87 is rotated to raise or lower the crown block 65, the indicator 91 is actuated at the exterior of the body where suitable calibrations 94 may be provided to cooperate with the indicator thereby indicating the movement to be attained at the working end of the line.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. Apparatus of the character described, including a horizontally disposed U-shaped frame having a horizontal elongate carriage, a vertical standard projecting up from one end of the carriage and an arm projecting from the upper end of the standard and overlying the carriage, a power driven crank mechanism carried by the carriage and including a rotating shaft and a crank arm on the shaft, a line operated by the crank and extending from the carriage longitudinally of the standard and then to the outer end portion of the arm, a pulley mechanism engaged by the line and multiplying the motion imparted to the line by the crank, and a second pulley mechanism engaged by the line and varying the motion
2,631,582 7 of the line at the outer end portion of the arm resulting from operation of the crank.

2. Apparatus of the character described, including a horizontally disposed U-shaped frame having a longitudinal elongate carriage, a vertically disposed tubular standard projecting up from one end of the carriage and defining a closed chamber and an arm projecting horizontally from the upper end of the standard and overlying the carriage, a power driven crank mechanism carried by the carriage and including a rotating shaft and a crank arm on the shaft, a line operated by the crank arm and extending from the carriage longitudinally of the standard and then to the outer end portion of the arm, and a pulley mechanism confined within the chamber defined by the standard varying the motion of the line at the outer end portion of the arm resulting from operation of the crank.

3. Apparatus of the character described, including a horizontally disposed U-shaped frame having a horizontal elongate carriage, a vertical standard projecting up from one end of the carriage and an arm projecting from the upper end of the standard and overlying the carriage, a power driven crank carried by the carriage, a line operated by the crank and extending from the carriage longitudinally of the standard and then to the outer end portion of the arm, and a pulley mechanism engaged by the line and multiplying the motion imparted to the line by the crank.

4. Apparatus of the character described, including a horizontally disposed U-shaped frame having a horizontal elongate carriage, a vertical standard projecting up from one end of the carriage and an arm projecting from the upper end of the standard and overlying the carriage, a power driven crank mechanism carried by the carriage and including a rotating shaft and a crank arm on the shaft, a line operated by the crank arm and extending from the carriage longitudinally of the standard and then to the outer end portion of the arm, and a pulley mechanism engaged by the line varying the motion of the line at the outer end portion of the arm resulting from operation of the crank.

5. Apparatus of the character described, including a horizontally disposed U-shaped frame having a horizontal elongate carriage, a vertical standard projecting up from one end of the carriage and an arm projecting from the upper end of the standard and overlying the carriage, a power driven crank carried by the carriage, a line operated by the crank and extending from the carriage longitudinally of the standard and then to the outer end portion of the arm, and a pulley mechanism including a vertically slidable crown block, means supporting the crown block in a selected position, a traveling block normally tending to move away from the crown block, and a stop limiting movement of the traveling block toward the crown block, the line being engaged with the blocks and operating between them.

6. Apparatus of the character described, including a horizontally disposed U-shaped frame having a horizontal elongate carriage, a vertical standard projecting up from one end of the carriage and an arm projecting from the upper end of the standard and overlying the carriage, a power driven crank carried by the carriage, a line operated by the crank and extending from the carriage longitudinally of the standard and then to the outer end portion of the arm, and a pulley mechanism including a vertically slidable crown block, means supporting the crown block in a selected position, a traveling block normally tending to move away from the crown block, and a stop limiting movement of the traveling block toward the crown block, the line being engaged with the blocks and operating between them.

7. Apparatus of the character described, including a horizontally disposed U-shaped frame having a horizontal elongate carriage, a vertical standard projecting up from one end of the carriage and an arm projecting from the upper end of the standard and overlying the carriage, a power driven crank carried by the carriage, a line operated by the crank and extending from the carriage longitudinally of the standard and then to the outer end portion of the arm, and a pulley mechanism including a vertical guide carried by the guide, a drum operated member supporting the crown block in an adjustable position along the guide, a traveling block freely slideable along the guide, and a stop limiting movement of the traveling block toward the crown block, the line being engaged with the blocks and operating between them.

8. Apparatus of the character described, including a horizontally disposed U-shaped frame having a horizontal elongate carriage, a vertical standard projecting up from one end of the carriage and an arm projecting from the upper end of the standard and overlying the carriage, a power driven crank carried by the carriage, a line operated by the crank and extending from the carriage longitudinally of the standard and then to the outer end portion of the arm, and a pulley mechanism including a vertical guide carried by the guide, a drum operated member supporting the crown block in an adjustable position along the guide, a traveling block freely slideable along the guide, and a stop limiting movement of the traveling block toward the crown block, the line being engaged with the blocks and operating between them.

9. A machine of the character described, including a power operated crank, a line operated by the crank, guide means handling the line so it has a working end portion remote from the crank, and means engaging the line and multiplying the action of the crank on the line, said engaging means including, a plurality of pulleys and a moving pulley carried by the crank, the line having a fixed end and a portion adjacent the fixed end and engaged around the said pulleys.

10. A machine of the character described, including a power operated crank, a line operated by the crank, guide means handling the line so it has a working end portion remote from the crank, and means varying the motion of the working end of the line, said varying means including, a vertically slidable crown block, a traveling block normally tending to move away from the crown block, and a stop limiting movement of the traveling block toward the crown block, the line being engaged around and between said blocks.

11. A machine of the character described, including a power operated crank, a line operated by the crank, guide means handling the line so it has a working end portion remote from the crank,
means engaging the line and multiplying the action of the crank on the line, said engaging means including, a fixed pulley and a moving pulley carried by the crank, the line having a dead end and a portion adjacent the dead end and engaged around the said pulleys, and means varying the motion of the working end of the line, said varying means including, a vertically adjustable crown block, a traveling block normally tending to move away from the crown block, and a stop limiting movement of the traveling block toward the crown block, the line being engaged around and between said blocks.

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