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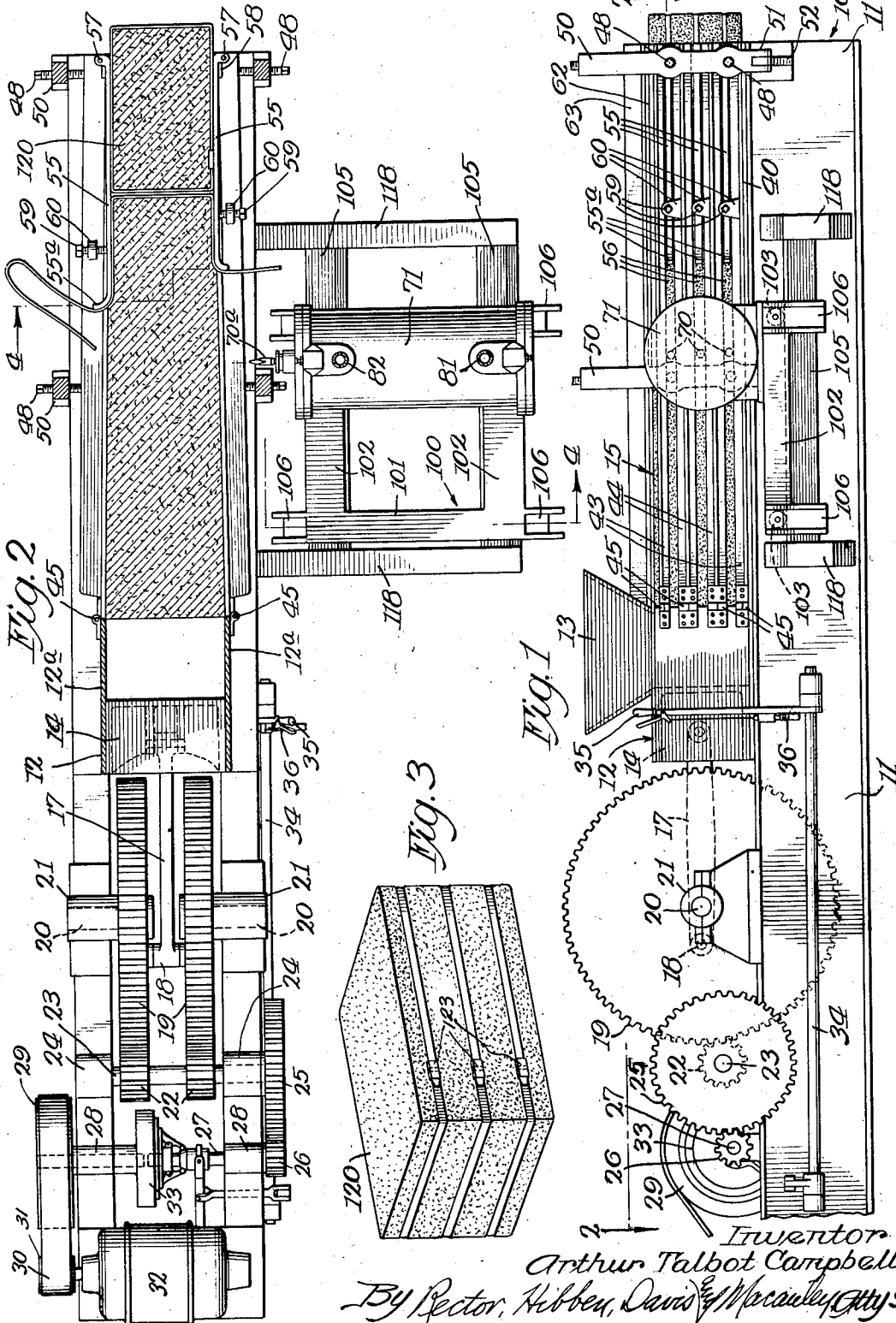
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2,037,211

METHOD OF BALING PAPER PULP

Filed July 28, 1932

3 Sheets-Sheet 1



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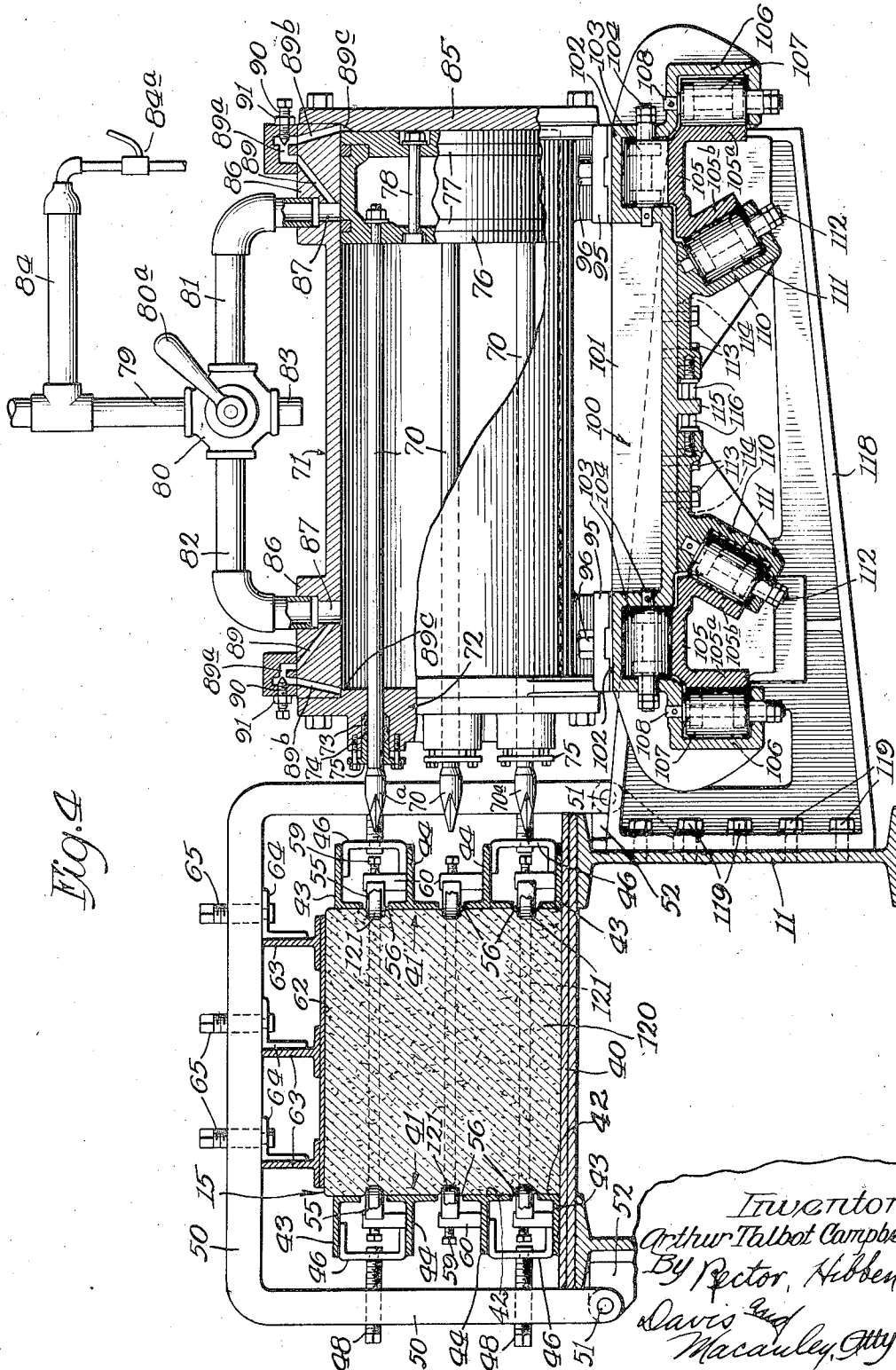
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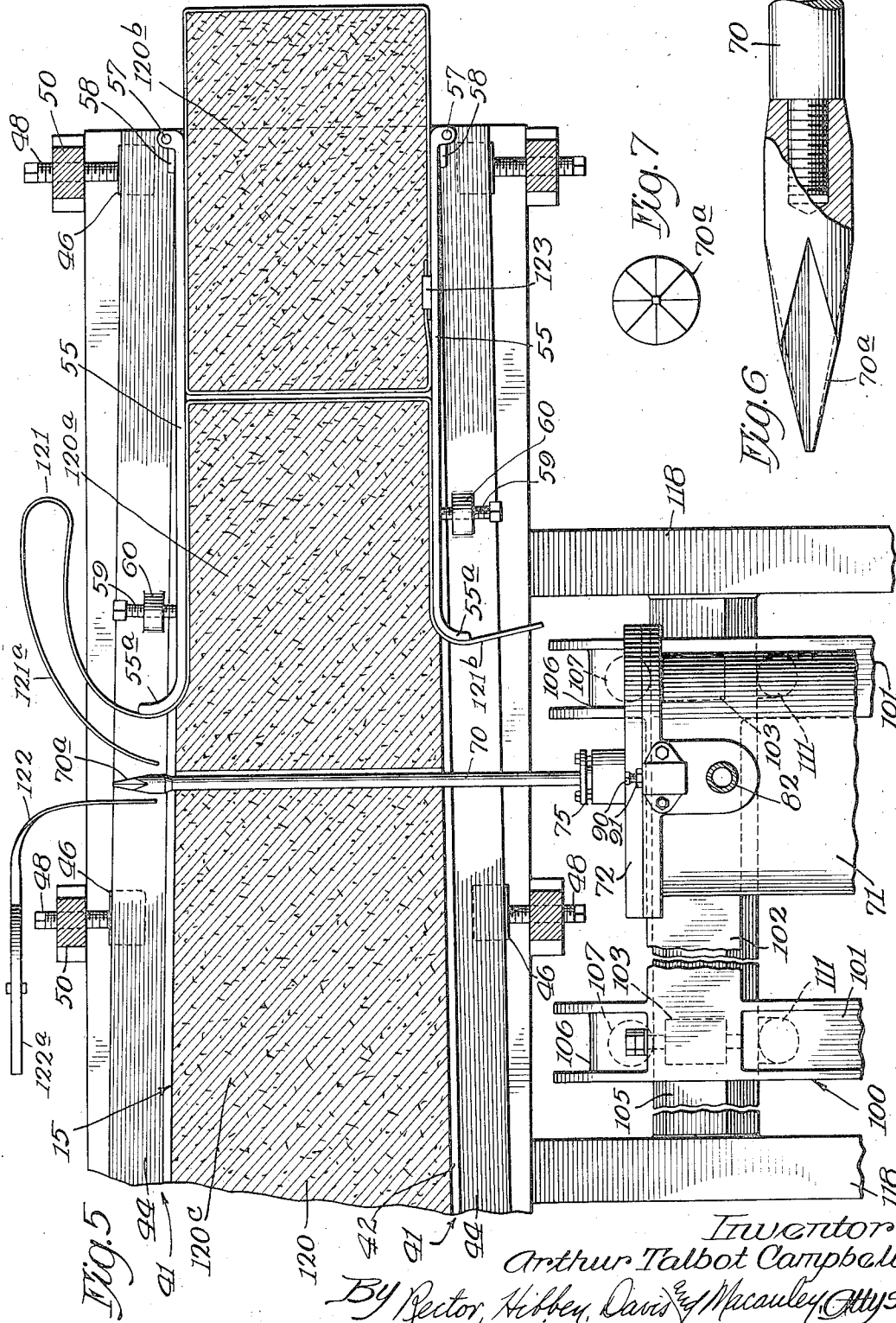
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UNITED STATES PATENT OFFICE

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METHOD OF BALING PAPER PULP

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Application July 28, 1932, Serial No. 625,388

1 Claim. (Cl. 100—20)

This invention relates to improvements in methods of baling paper pulp, such as shredded paper pulp and the like, and its purpose is to provide a more rapid and more efficient method of baling paper pulp and other products, as compared with other methods and apparatus heretofore used. The present invention is an improvement upon that described and claimed in the co-pending application of John Ekern Ott, Serial No. 588,318, filed January 23, 1932. The principal object of the invention is to provide an improved method of baling according to which a quantity of pulp is compressed and advanced through a confining chamber provided with means for permitting a needle or other tool to be passed through the body of compressed pulp at intervals for the purpose of providing holes through which flexible binders may be threaded, after which the binder is drawn taut around the units of paper pulp which are separated by the thrusts of the needle, thus simplifying and speeding up the operation of separating the pulp into units and passing a binder around each unit. Still another object of the invention is to provide an improved method of baling according to which a mass of pulp is compressed into an elongated traveling body of pulp which is then engaged at intervals by a series of needles or other instruments forming holes through which flexible binders are threaded, so that the body of compressed pulp is divided into units by the action of the needles and the flexible binders are then in position to be drawn taut around the separate units and then fastened to secure these units in the form of bales.

The nature of the invention will be understood from the following specification taken with the accompanying drawings, in which one example of the method is set forth in connection with one form of the improved apparatus. In the drawings,

Fig. 1 shows a side elevation of one form of the improved baling apparatus of the present invention which is capable of use in practicing the improved method of the present invention;

Fig. 2 shows a longitudinal section on the line 2—2 of Fig. 1, illustrating the major portion of the apparatus in top plan view;

Fig. 3 is a perspective view of the completed bale after the binders have been drawn taut around the bale and their ends secured together;

Fig. 4 shows an enlarged transverse section on the line 4—4 of Fig. 2;

Fig. 5 shows an enlarged horizontal section, similar to that of Fig. 2, through the right-hand

portion of the apparatus illustrating the positions of the needles and the flexible binders preliminary to threading the binders through the compressed pulp;

Fig. 6 shows a side elevation of the end portion of one of the needles; and

Fig. 7 shows an end elevation of the point of the needle shown in Fig. 6.

As illustrated in the drawings, the improved baling apparatus comprises a frame 10 having a pair of longitudinal frame members 11, in the form of I-beams, which are adapted to rest upon the floor or other support and which carry all parts of the apparatus. At a point midway between the ends of the frame 10, there is mounted a casing 12 having an opening in its upper side which communicates with a hopper 13 through which the shredded paper pulp or the like is introduced into the casing. The casing 12 is rectangular in cross-section and one end of this casing has mounted therein a plunger or piston 14 which is adapted to reciprocate for the purpose of compressing the pulp and feeding it from the casing through a chute 15 in which the compressed pulp is divided into units and in which the units are bound together by the means hereinafter described.

For the purpose of reciprocating the piston 14, it is connected by a piston rod 17 to a crank pin 18 which is located eccentrically on two large gears 19. These gears are mounted on a shaft 20 journaled in bearings 21 carried by the frame members 11 and they are sufficiently large to serve as a flywheel for maintaining a regular action of the reciprocating piston 14 regardless of the resistance encountered by this piston upon its engagement with the pulp in the casing 12. The gears 19 are driven by pinions 22 which are fixed on a shaft 23 journaled in bearings 24 secured to the frame members 11 and this shaft is in turn driven by a gear 25 secured thereon and meshing with a pinion 26. This pinion 26 is secured upon a transverse shaft 27 which is journaled in bearings 28 carried by the frame members 11. At a point beyond the frame members, the shaft 27 has a flywheel pulley 29 secured thereon to be driven by a belt 30 passing around a driving pulley 31 fixed upon the shaft of the electric driving motor 32.

The reciprocation of the piston 14 may be started and stopped by starting or stopping the motor 32 and the speed of movement of the piston may be varied by varying the speed of the motor but, in addition, a friction clutch 33 is preferably provided in the driving connections between the

motor and the gear 19 and this clutch is actuated through a shaft 34 extending alongside the front frame member 11. An operating lever 35 is secured on this shaft adjacent the hopper 13 and the lever may be locked in position by means of a detent engaging a quadrant 36. This enables the operator to control the operation of the piston 14 from a position adjacent the hopper through which the pulp is fed into the casing so that the action of the piston may be regulated to suit the volume of the pulp and the degree of its compression.

As the pulp passes from the casing 12, it is caused to move along the chute 15 which comprises a bottom wall or plate 40 secured on the upper flanges of the I-beams 11, as shown particularly in Fig. 4. The side walls 41 of the chute are made up of a number of separate bars or beams which are spaced apart and capable of adjustment in order that the degree of compression of the pulp may be increased as it travels rearwardly through the chute. Each side wall 41 comprises a series of longitudinal plates 42 arranged in vertical planes and constituting the vertical flanges of carrying bars comprising upper and lower angle bars 43 and upper and lower T-bars 44. The bars 43 and 44 are connected at their forward ends to the side walls 12^a of the casing 12 by means of hinges 45. At other points between the hinges and the rear ends of the bars, they are connected together in pairs, the upper bar 43 being connected to the next adjacent T-bar 44 by means of brackets 46 while the lower angle bar 43, which is adapted to slide over the surface of the bottom plate 40, is connected to the T-bar 44 by means of other brackets 45. For the purpose of swinging the side walls of the chute about the hinges 45 at the forward ends thereof, the brackets 46 are rotatably engaged by threaded adjusting members 48 which engage threaded apertures in the side arms of yokes 50 which pass over the chute and which are pivotally connected at 51 to supporting brackets 52 carried by the frame members 11. By rotating the adjusting members 48, through the operation of wrenches applied to their outer squared extremities, the rear portions of the plates 42 which constitute the side walls of the chute may be caused to converge rearwardly to a greater or less degree in order to secure the desired degree of compression of the paper pulp as it moves along the chute.

The side walls 41 of the chute 15 are preferably further provided adjacent the rear ends thereof with friction shoes or plates 55 which occupy the slots 56 formed between the spaced plates 42 of the side walls. These friction plates are mounted at their rear ends on pivots 57 carried by brackets 58 secured to the supporting beams 43 and 44 and they are adapted to swing inwardly between the plates 42 for the purpose of engaging the flexible binders which are threaded through the paper pulp into position to pass around the individual units of the pulp which form the bales. In order to vary the pressure with which these plates or shoes 55 engage the flexible binders, they are engaged adjacent their forward ends by threaded adjusting members 59 which pass through bosses 60 carried by the supporting bars 43 and 44. The ends of these adjusting members bear against the outer sides of the friction plates or shoes and they are provided at their outer ends with heads adapted to be engaged by a wrench so that they may be turned to force the shoes inwardly about their pivots. The forward ends of the friction

shoes 55 are curved as shown at 55^a to permit the flexible binders to pass outwardly thereover and to be drawn thereover as the pulp moves rearwardly in the chute.

The top wall of the chute 15 is formed by a flat metal plate 62 which is carried by a series of supporting T-beams 63. These beams are provided with angle plates 64 which are threadedly engaged by adjusting members 65 and these adjusting members also threadedly engage the top cross arms of the yokes 50. By adjusting the members 65, the top wall of the chute may be varied in elevation or may be inclined downwardly toward the rear end of the chute in order to cooperate with the side walls of the chute in effecting an increased compression of the pulp as it passes rearwardly.

For the purpose of providing holes to permit the threading of the flexible binders through the body of pulp as it passes rearwardly along the chute, there is provided a series of needles 70 which are adapted to move through the slots 56 formed between the plates 42 constituting the side walls of the chute. These needles have enlarged detachable sharpened heads or points 70^a, as shown in Figs. 6 and 7, and they are adapted to penetrate the pulp and form holes from which the needles may subsequently be withdrawn without difficulty. The flexible binder preferably employed is a flat steel strap and the heads 70^a of the needles are therefore preferably large enough to form holes through which the straps may readily be inserted. These needles are carried by a cylinder 71 having a cylinder head 72 secured in one end thereof and provided with apertures through which the needles are adapted to slide. The head 72 is provided with a packing chamber 73 around each needle and suitable packing material 74 is mounted in each chamber to be compressed by a packing gland 75 so that a fluid-tight joint is formed around each needle. The other ends of the needles within the cylinder are connected to a piston 76 which is adapted to reciprocate longitudinally of the cylinder and which is provided with packing rings 77 engaging the cylinder wall. The piston 76 is preferably hollow with the two parts thereof secured together by bolts 78. The reciprocation of the piston within the cylinder 71 is effected by fluid-pressure and a supply of compressed fluid, such as compressed air, is furnished through a pipe 79 which communicates with a four-way valve 80 having a handle 80^a. One outlet of the valve 80 leads through a pipe 81 to the head end of the cylinder 71 and another outlet from the valve 80 leads through a pipe 82 to the other end of the cylinder 71. Another outlet of the valve 80 leads through an exhaust pipe 83 to the atmosphere. A pipe 84, having a relief valve 84^a connected therein, is connected between the supply pipe 79 and the exhaust line to relieve excess pressure. The end of the cylinder opposite the head 72 is closed by a plate or head 85 and the upper side wall of the cylinder is provided with a pair of bosses 86 in which are mounted the discharge ends of the pipes 81 and 82. These pipes communicate with passages 87 which lead into the interior of the cylinder some distance from the heads 72 and 85 thereof. Each boss 86 in the cylinder wall is provided with a passage 89 which is inclined upwardly toward the end of the cylinder from the adjacent passage 87. The passage 89 is provided centrally with a U-shaped bend 89^a and the other arm 89^b of the passage extends downwardly to communicate with the cylinder cham-

ber through a groove 89^c which is formed in the adjacent cylinder head. The flow of compressed fluid through each passage 89 is controlled by a needle valve 90 having a threaded engagement with the boss 86 and entering the upper horizontal portion of the U-shaped passage 89^a. The needle valve 90 may be held in adjusted position by a lock nut 91. When the handle 89^a of the valve 80 is turned to cause the compressed air to communicate with the head end of the cylinder 71, the piston 76 is forced toward the left, as viewed in Fig. 4, thereby causing the needles 70 to penetrate the paper pulp. When this movement takes place, the compressed air in the other end of the cylinder is exhausted through the passage 87 at that end of the cylinder until that passage is closed by the movement of the piston over its mouth, whereupon the remaining air in that end of the cylinder is trapped and provides a cushion for the piston at the end of its travel. This trapped air is gradually relieved through the adjacent passage 89 so that the piston is stopped at the end of its stroke without shock. When the valve 80^a is reversed to admit compressed fluid to the end of the cylinder adjacent the head 72, this compressed fluid at first passes through the passage 89 to impart an initial movement to the piston 76 and the piston is actuated in this way until it passes the adjacent passage 87, whereupon compressed fluid is admitted thereto directly from the pipe 82. When the piston reaches the other end of its stroke, adjacent the head 75, the same cushioning action again takes place after the piston passes the other passage 87, the pressure at the end of the cylinder being gradually relieved through the other passage 89. When the air is being exhausted from either end of the cylinder through either of the pipes 81 or 82, that pipe is connected through the valve 80 with the exhaust pipe 83.

The cylinder 71 is provided on its under side with flanges 95 which are connected by studs 96 with the needle carriage 100. This carriage is in the form of a rectangular frame having a pair of transverse members 101 connected by longitudinal members 102. The members 101 and 102 are of channel form and each member 102 is provided at each end thereof with a roller 103 mounted to turn on roller bearings carried by a shaft 104 extending between the side walls of the frame member as shown in Fig. 4. The roller 103 is adapted to travel upon the upper surface of a track member 105 which extends parallel to the frame members 11. Each track member 105 is of substantially channel form having a vertical depending side member 105^a and an opposite inclined side member 105^b. The carriage 100 is provided at its corners with depending track portions 106 in each of which there is mounted a roller 107 adapted to bear upon the outer surface of one of the parts 105^a of one of the track members. These rollers 107 revolve about roller bearings carried by shafts 108 secured between the upper and lower walls of the parts 106. To the under side of the carriage 100, adjacent each corner thereof, there is secured a bracket 110 having a recess in which is mounted another roller 111. Each of these rollers bears upon the inclined part 105^b of one of the track members 105 and is mounted to revolve about roller bearings carried by an inclined shaft 112. In this way the needle carriage is provided at each corner with three rollers 103, 107 and 111 which engage the longitudinal track members 105 in such a way that a thrust upon the needle car-

riage in any direction is transmitted by the rollers to the stationary track members 105. In order that the rollers may be caused to engage the track members closely at all times, the bracket members 110 are secured to the under side of the carriage by studs 113 engaging slots 114 in the horizontal flanges of the brackets. A lug 115 projects downwardly from the bottom of the carriage at each end thereof and this lug is engaged on opposite sides by the heads of adjusting members 116 which threadedly engage apertures in the ends of the brackets 110 so that these adjusting members may be caused to transmit to the lug 115 the thrust which is transmitted through the brackets 110 by the rollers 111. This arrangement permits the needle carriage to move parallel to the longitudinal axis of the chute 15 without having at any time any lost motion with respect to its support.

The track members 105 are secured at their ends to supporting brackets or frames 118 which are secured to the adjacent frame member 11 by studs 119, as shown in Fig. 4. The needle carriage is thus capable of movement longitudinally of the chute 15 so that the needle 70 may be inserted through and withdrawn from the body of moving pulp in the chute without interfering with that movement. To permit this movement of the needle carriage and the cylinder 71, the supply pipe 79 is connected by a flexible conduit with the source of compressed fluid supply.

In the embodiment illustrated, there are three needles 70 mounted one above the other in the same vertical plane and these needles are located in registry with the slots 56 between the plates 42 of the side walls of the chute so that when compressed fluid is admitted to the head end of the cylinder 71, the needles are forced simultaneously through the body of pulp 120 which is located within the chute. In the operation of the invention, the pulp is fed into the hopper 13 and it falls into the casing 12 where it is engaged by the reciprocating piston 14. This piston compacts the pulp and gradually feeds it from the casing to the chute 15 with the result that it is compressed into a more or less solid mass which acquires greater compactness as it passes rearwardly between the converging walls of the chute. In order to divide the body of pulp 120 into units and to permit the threading of the flexible binders through the pulp, the needles are first forced through the pulp by admitting compressed air to the cylinder 71 at the head end thereof to cause the needles to assume the position shown in Fig. 5, where there are illustrated the relative conditions of the parts and the binders after one bale has been formed and another is in the process of formation. When in this condition, one series of flexible binders 121 will have been partially passed around a unit 120^a of the body of pulp as a result of a preceding operation in which these binders have been inserted through holes made through the pulp by a preceding operation of the needle 70, and another unit 120^b of the body of pulp will have been formed into a completed bound bale or bundle. To complete the operation of binding the unit 120^a, the needles are first forced through the pulp, as shown in Fig. 5, to form a series of holes through which the free ends 121^a of the binding straps may be inserted or threaded after the needles have been withdrawn. The practice of forming the holes through the pulp by the needles and then withdrawing the needles preliminary to threading the binding straps through the holes is now consid-

ered preferable to the practice of providing the needles with eyes through which the straps may be inserted and then drawn through the holes by the operation of withdrawing the needles. Accordingly, the needles are withdrawn from the position shown in Fig. 5 and the free ends 121^a of the binders 121 are inserted through the holes at the same time that another series of binders 122 are inserted through the same holes in preparation for the binding of the next following unit of the pulp 120^c. When this threading operation has been completed, the extremities of the ends 121^a of the binders 121 are located adjacent to the other free ends 121^b of the same binders, on the side of the machine adjacent the needle carriage. The two ends of each binder which are thus located adjacent to each other are then engaged by the operator and drawn taut, although if the friction shoes 55 are employed, the strap will have previously been drawn taut around a major portion of the unit 120^a by the engagement of the straps with the shoes as the pulp moves rearwardly. When the ends of each binder are drawn taut, they are secured together by suitable means such as the seals 123 illustrated in Figs. 3 and 5, which may be of the form described and claimed in the United States patent of Ralph H. Norton No. 1,260,016, dated March 19, 1918. When all of these binders 121 have been thus secured at their ends, the formation of a bale from the unit 120^a of the pulp is substantially completed and this bale then moves rearwardly along the chute while at the same time the next forward portion 120^c of the pulp moves rearwardly with its rear end engaged by the transversely extending straps which have been previously inserted through the holes in the pulp, as heretofore described. As the unit 120^c of the pulp moves rearwardly, the straps 122 engage the friction shoes 55, in the embodiment here shown, and are drawn taut around the rear end to the opposite sides of the unit 120^c in the same way that the straps 121 were previously drawn taut around corresponding portions of the unit 120^a. When the portion 120^c of the body of pulp has advanced rearwardly to a sufficient extent, the needles 70 are again thrust through the body of pulp by admitting compressed fluid to the head end of the cylinder 71, thus forming a new series of holes through the pulp. The valve 80 is then

operated to admit compressed fluid to the opposite end of the cylinder 71, whereupon the needles are withdrawn, leaving holes through the pulp through which the free ends of the straps 122 are then inserted along with the ends of another series of straps for another oncoming body of pulp and holes are provided for threading the straps which are employed for binding each unit. The operation of threading the binders or straps through the pulp and the succeeding operation of securing the ends of each binder together are carried on without arresting the movement of the pulp rearwardly through the chute and as the binding of each unit is completed by the applications of the seals thereto, it travels rearwardly through the chute until it emerges from the rear end thereof. The bound unit may then be broken off from the remaining portion of the body of pulp to form the separate bale illustrated in Fig. 3. It will be understood that after the penetration of the pulp by the needles and the subsequent binding of the separate units of pulp, the pulp of one unit remains united to the pulp of the next adjacent unit except for the holes which are made by the needles but each unit may be readily severed from the next following unit when it reaches the rear end of the chute and is projected therefrom.

Although one example of the improved method of baling has been described in connection with the disclosure of one form of apparatus which may be used in practicing the method, it will be understood that the method may be practiced in various ways coming within the scope of the appended claim.

I claim:

The method of baling paper pulp and the like which comprises the steps of forming an elongated body of compacted pulp, maintaining said body of pulp in intermittent motion, thrusting a needle through said pulp and then withdrawing said needle and inserting a flexible binder through the hole made by said needle, then thrusting said needle through said moving pulp at another point and withdrawing said needle and inserting a portion of said binder through the hole made by said needle at said last-mentioned point, and then drawing taut and securing together the ends of said binder.

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