

No. 696,186.

Patented Mar. 25, 1902.

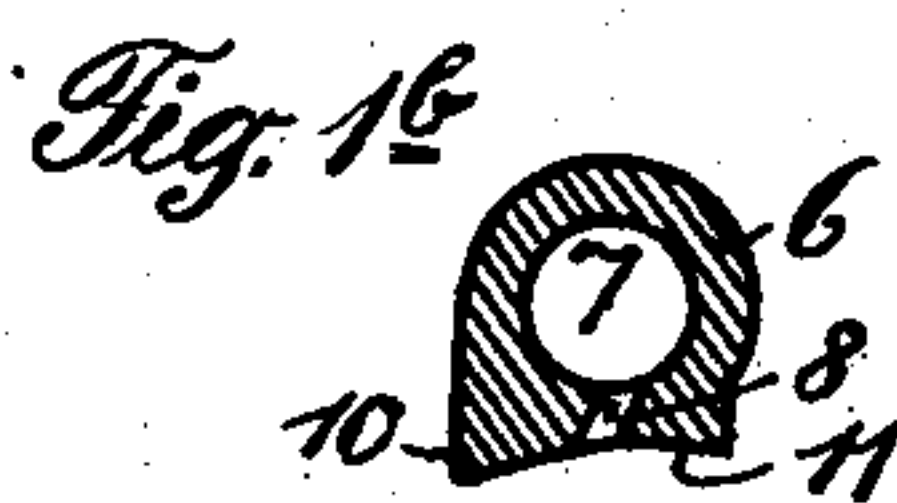
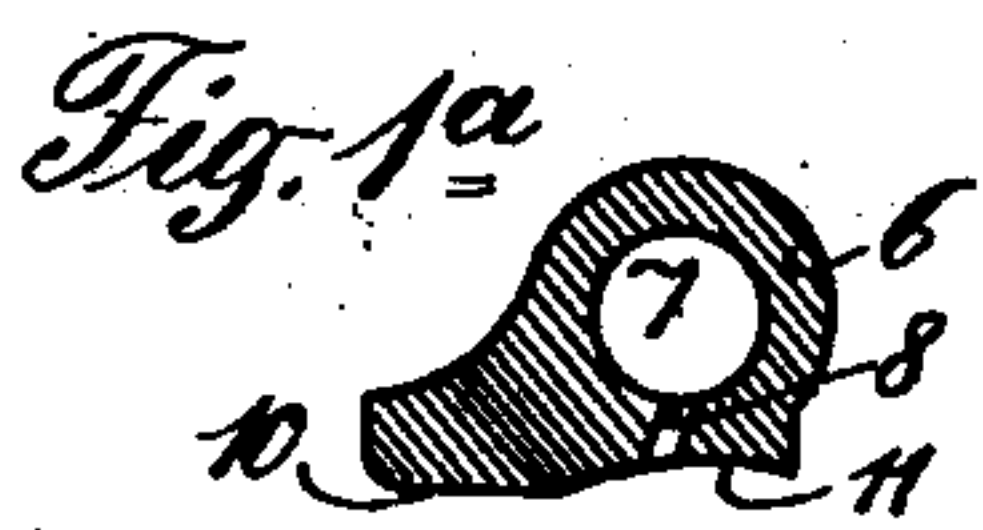
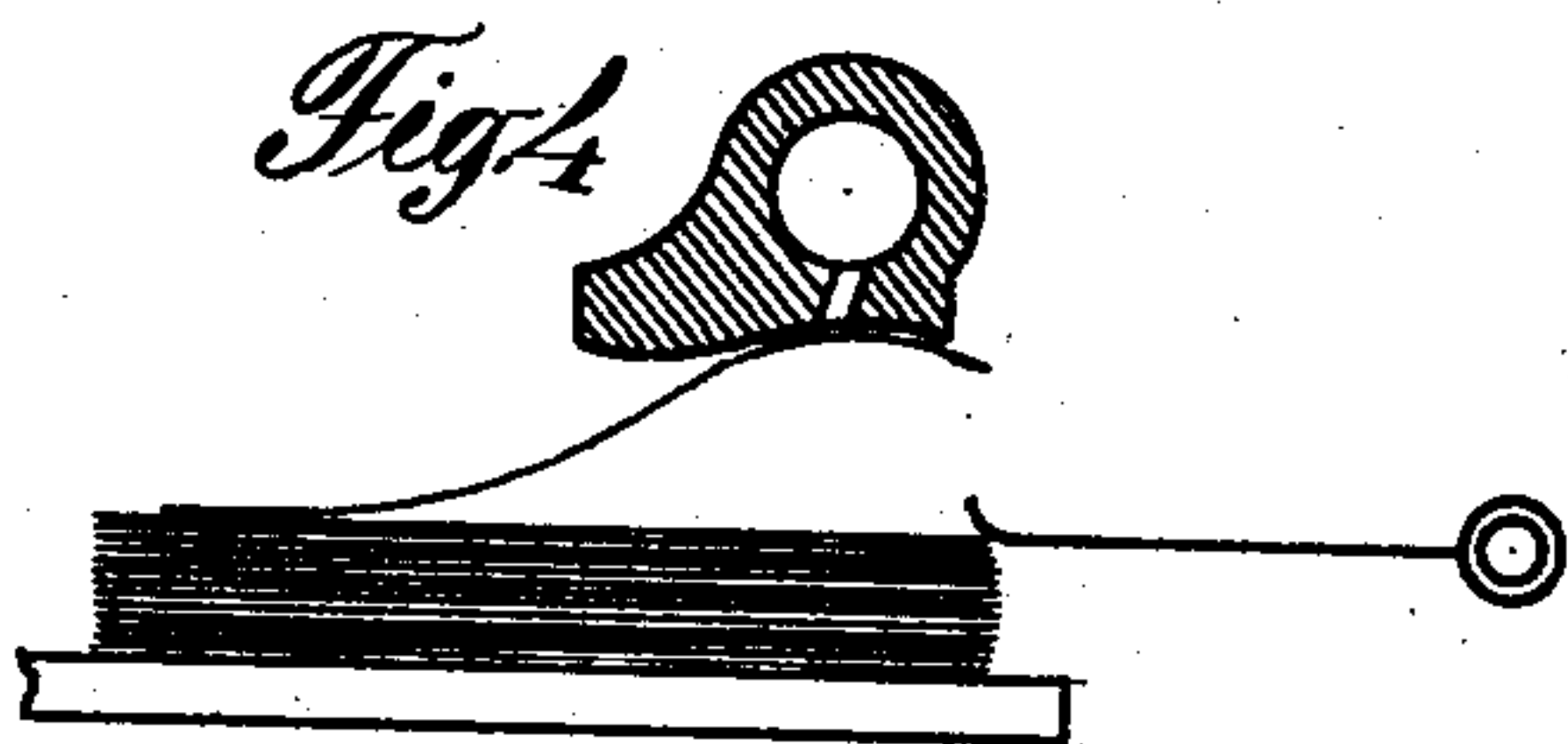
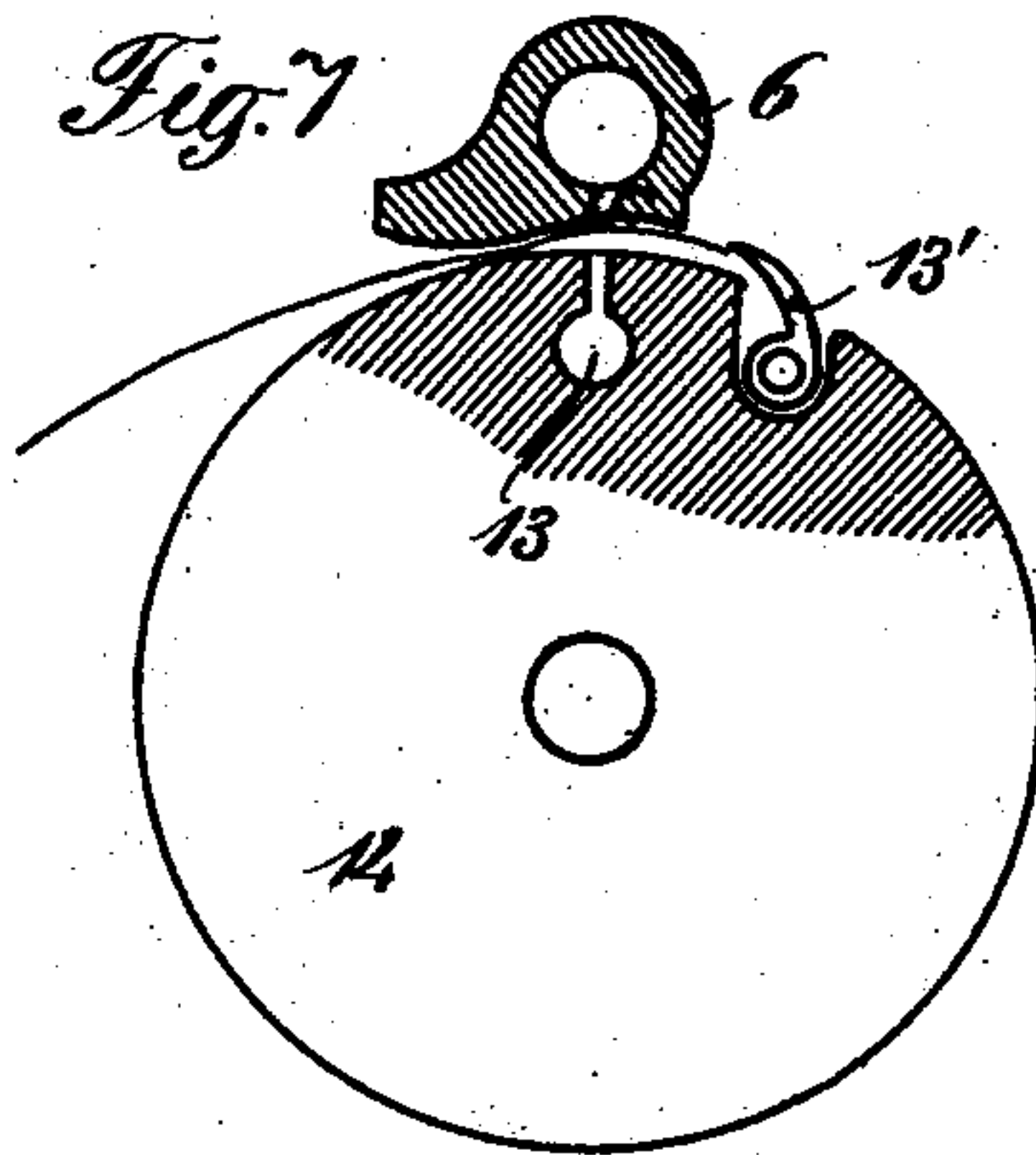
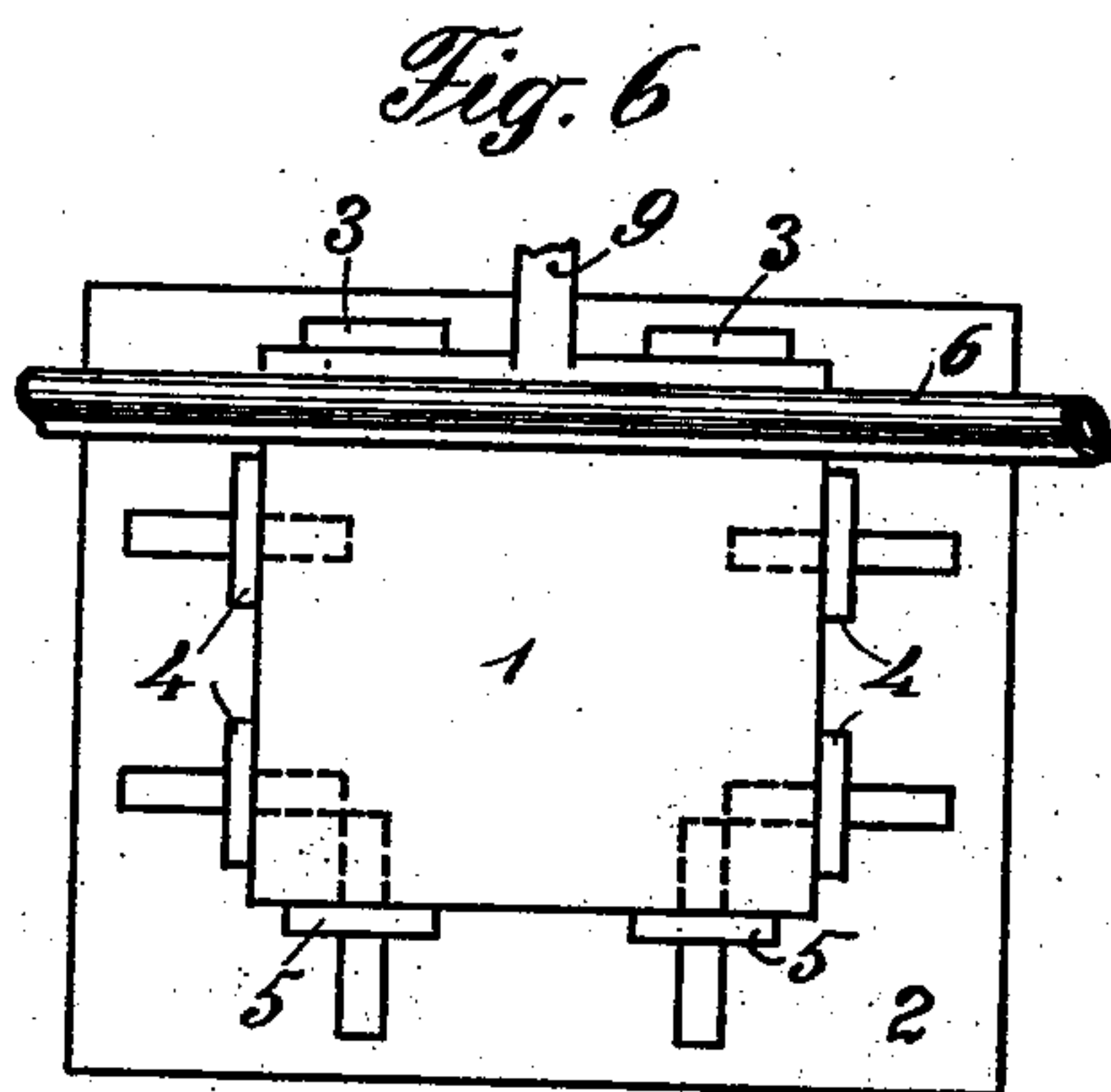
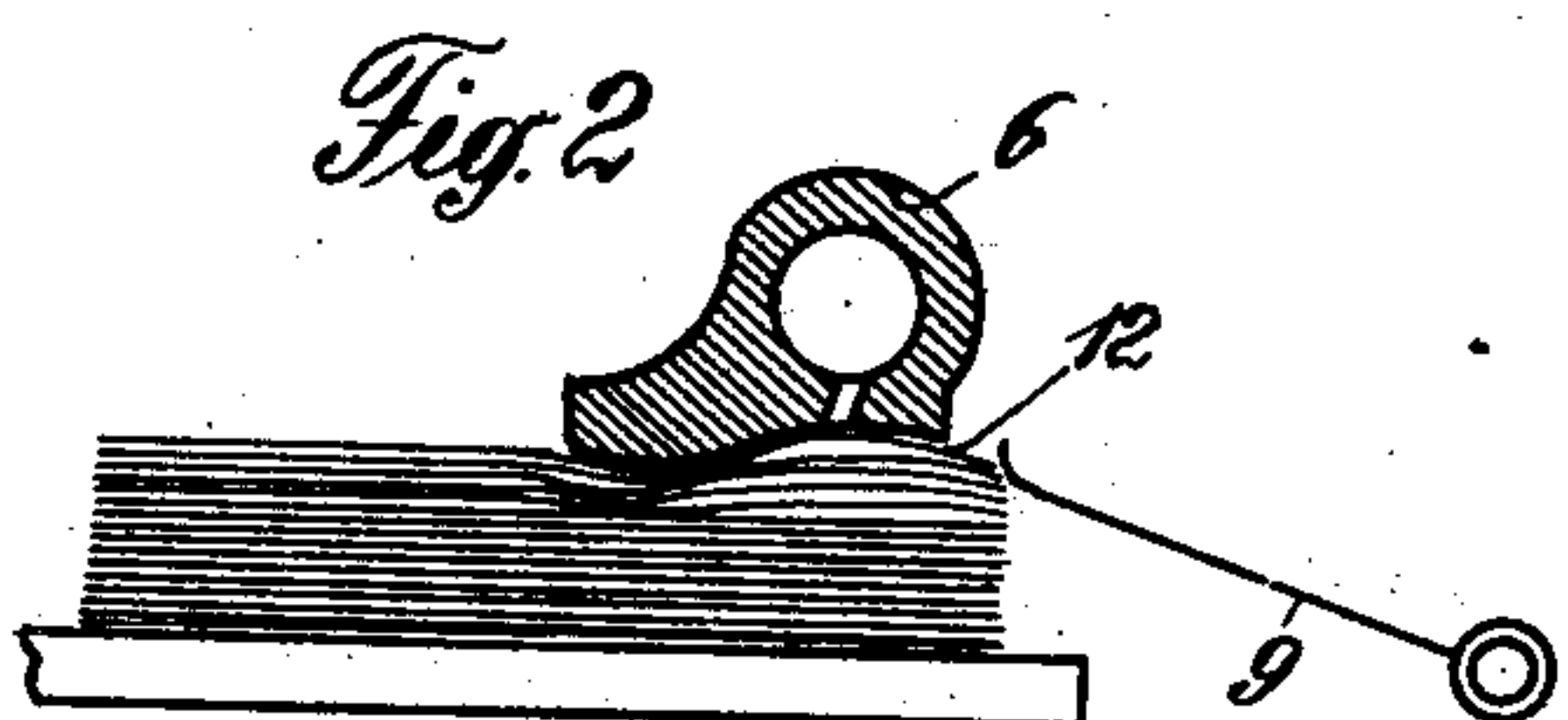
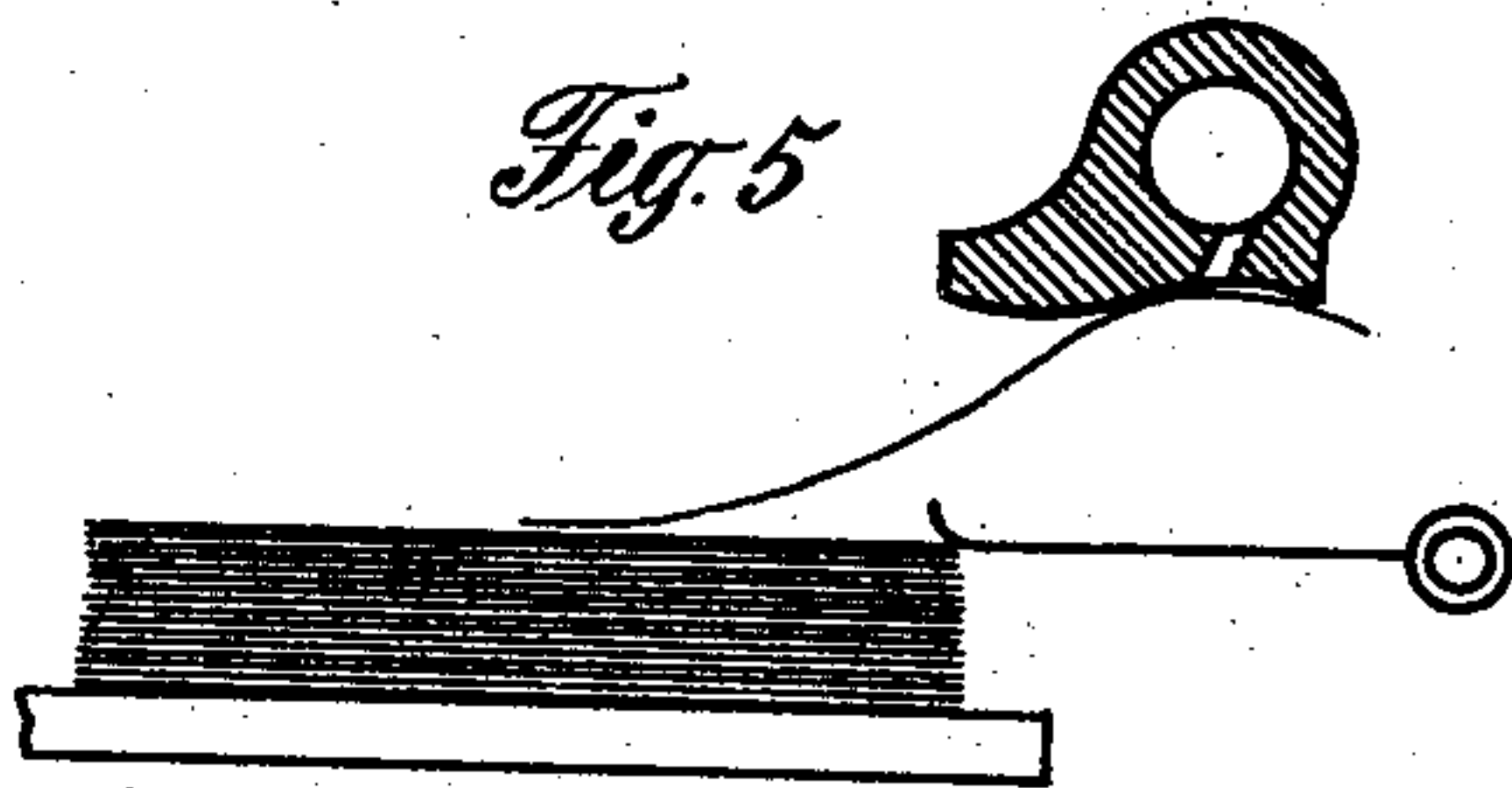
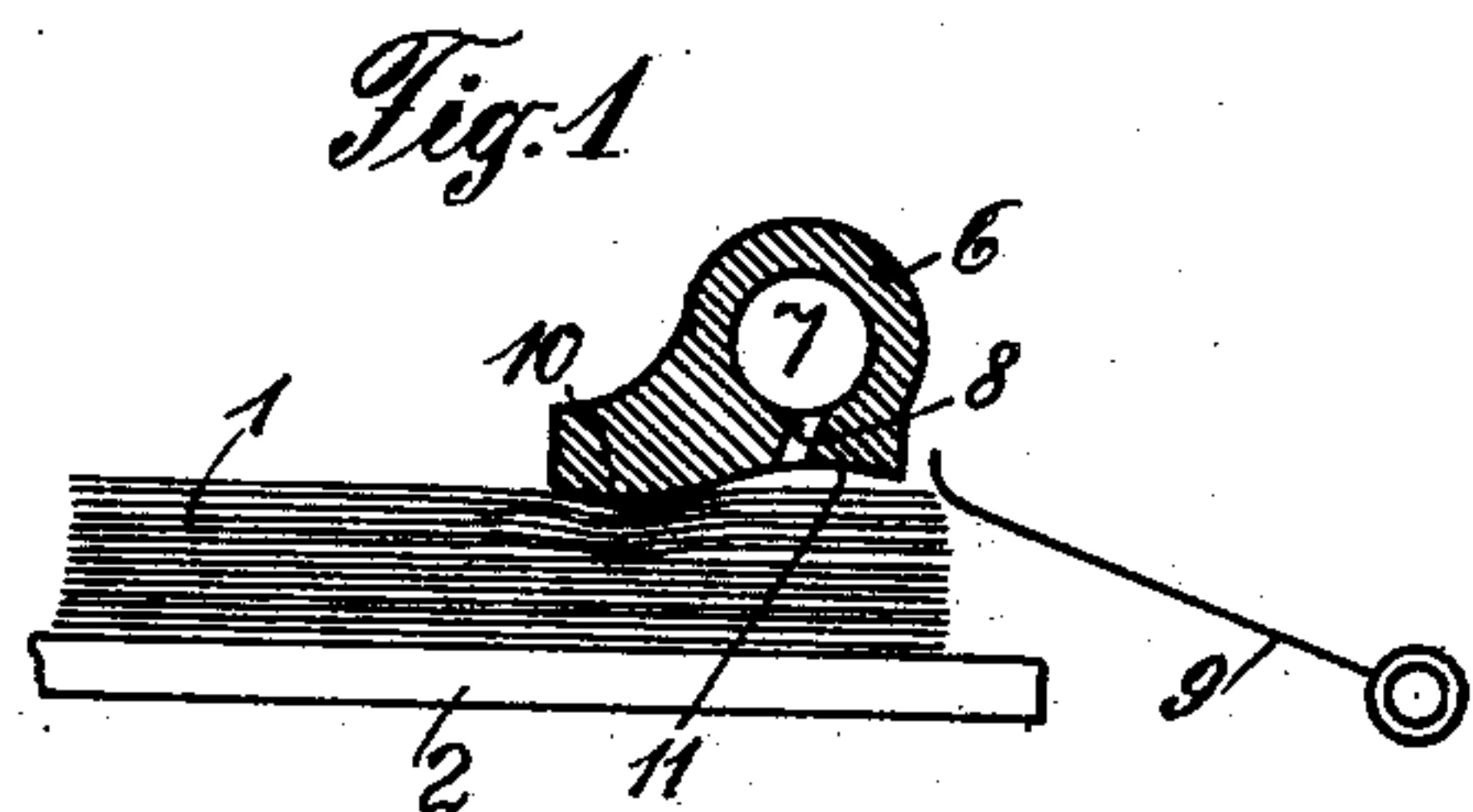
I. ORLOFF.

APPARATUS FOR LIFTING OFF AND REMOVING SHEETS FROM A PILE.

(Application filed Sept. 7, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:  
E. M. Olmsted.  
William E. Neff

Inventor:  
Ivan Orloff.  
by J. A. Watson. atty

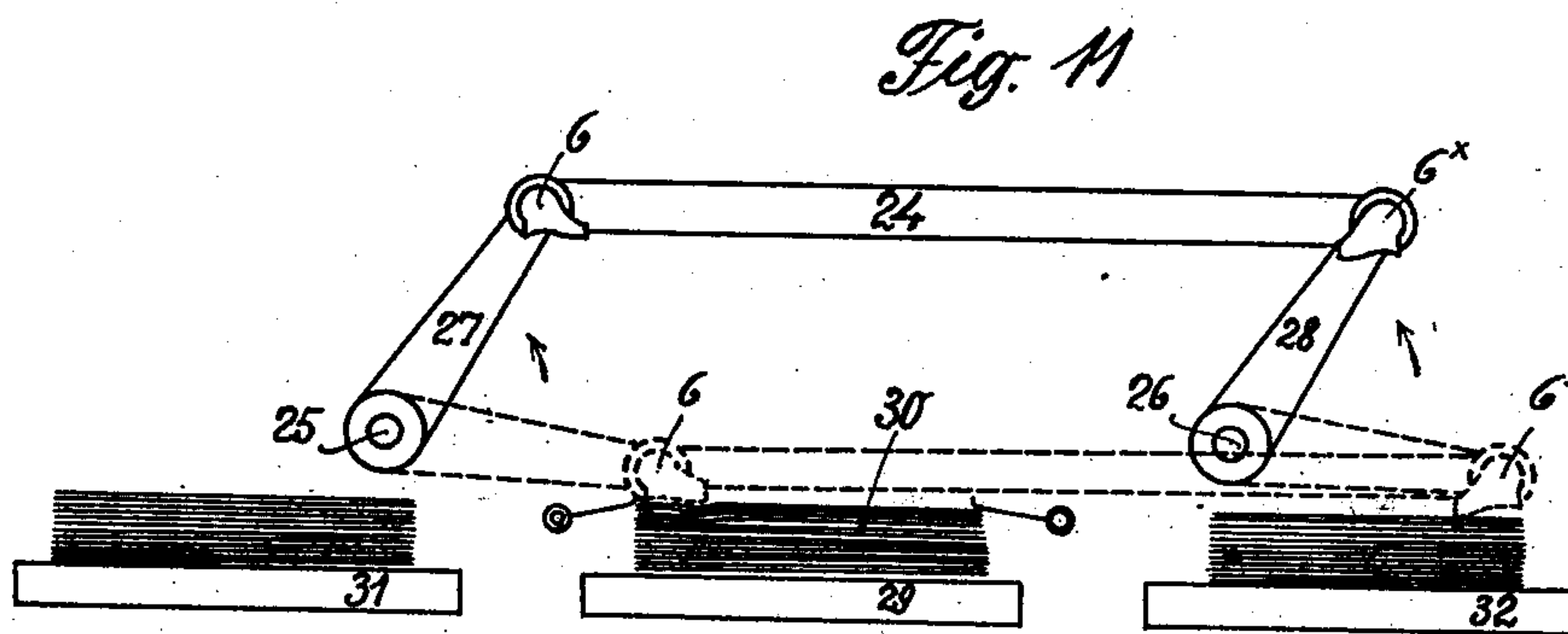
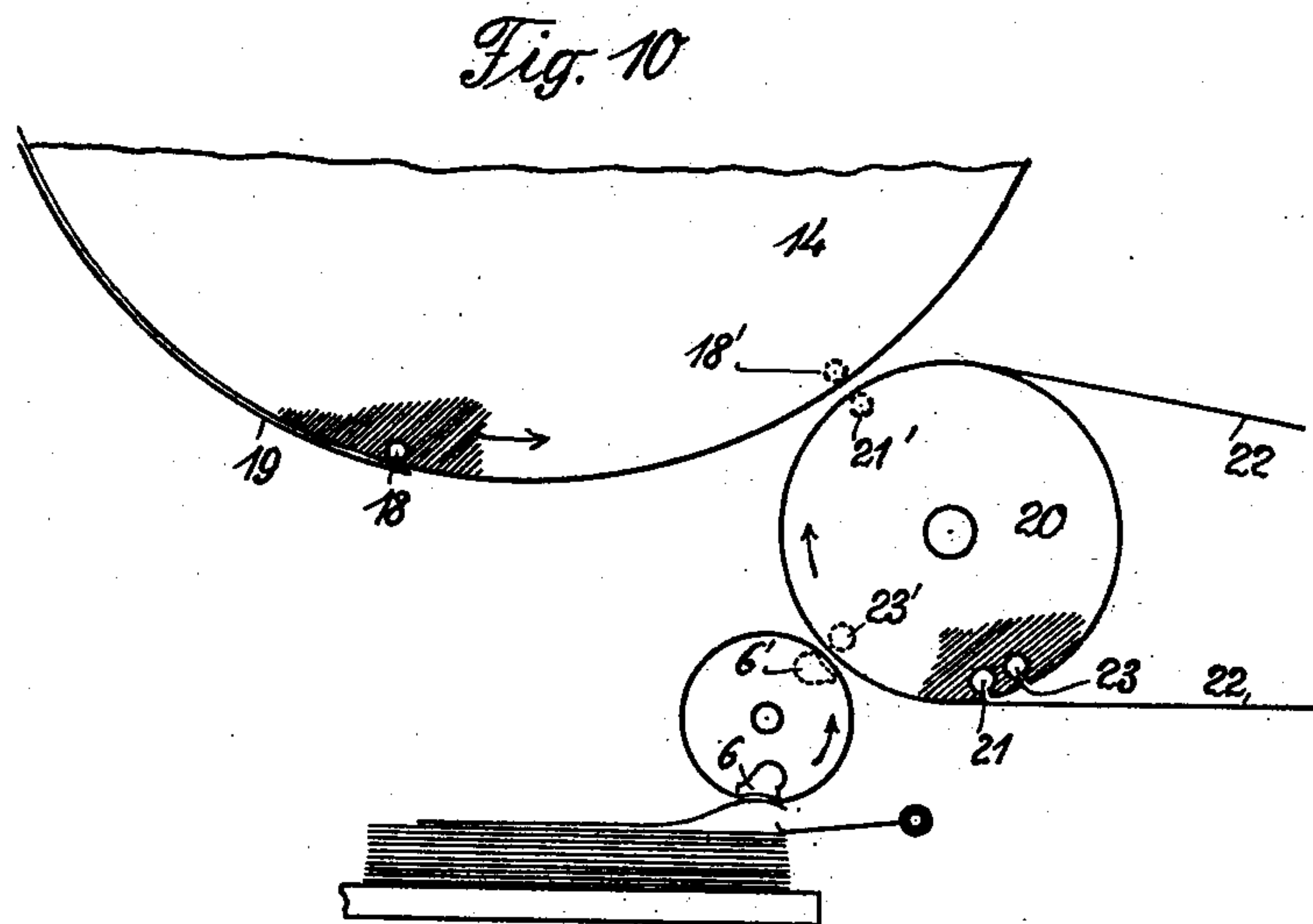
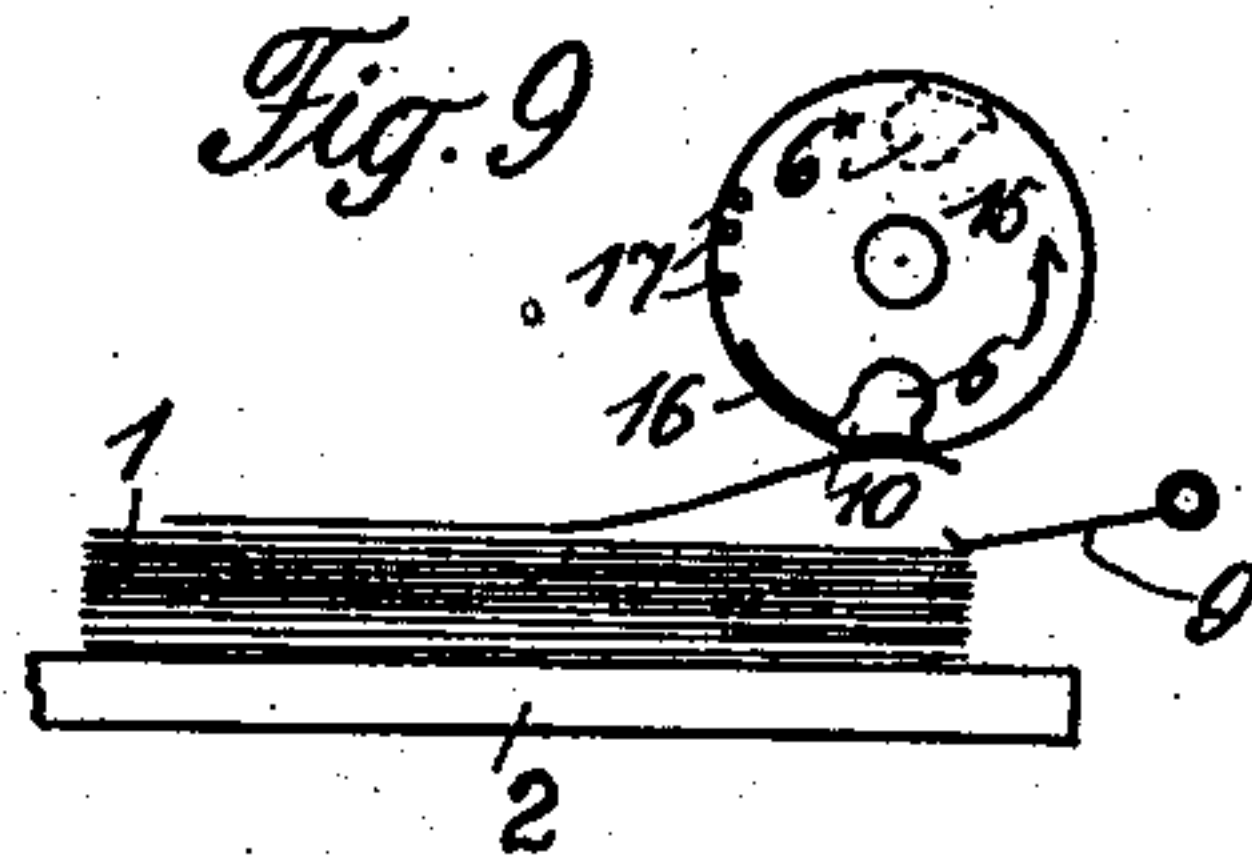
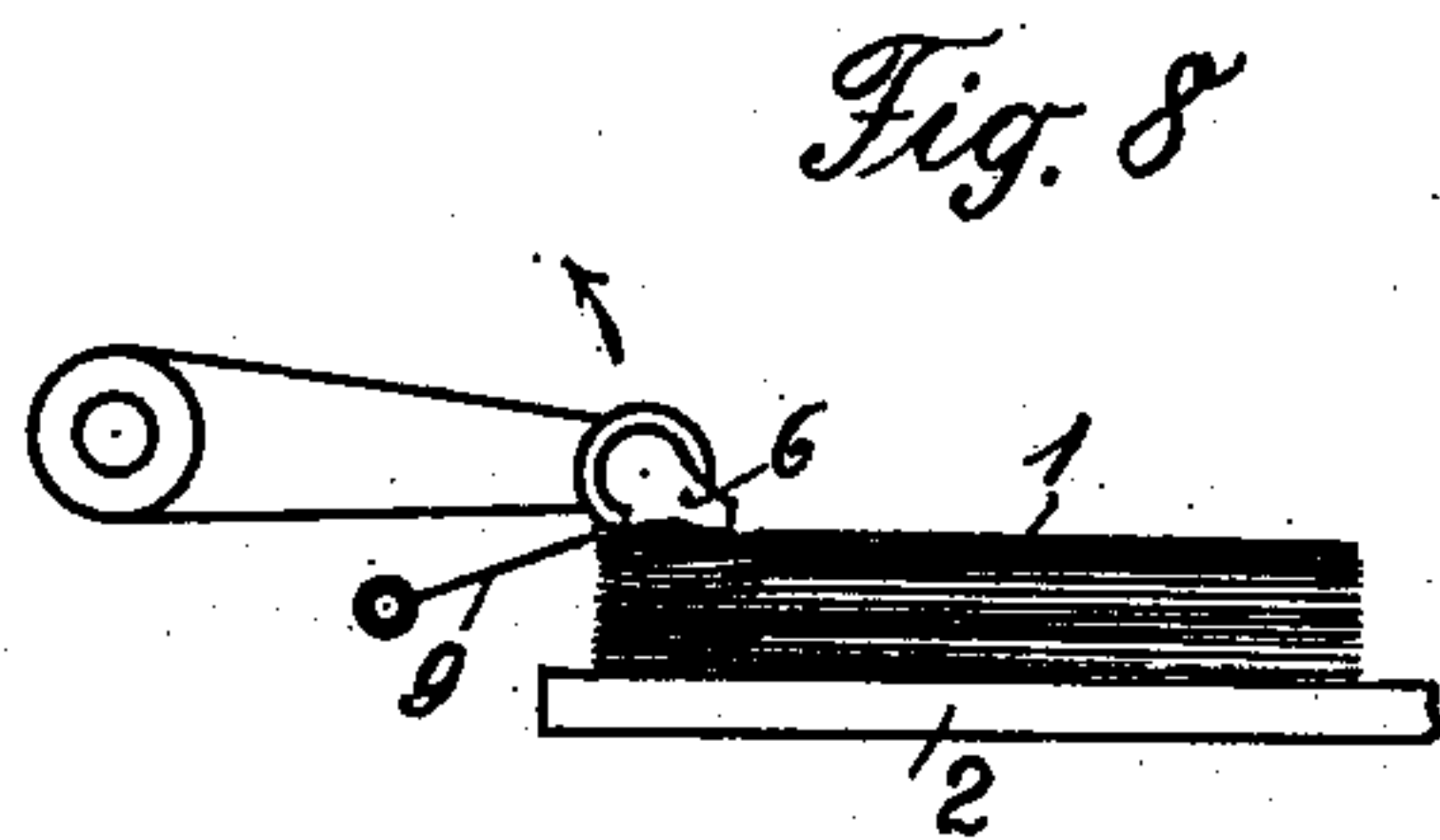
I. ORLOFF.

## APPARATUS FOR LIFTING OFF AND REMOVING SHEETS FROM A PILE.

(Application filed Sept. 7, 1899.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:-  
E. M. Olmsted  
William E. Steff

Inventor:  
Ivan Orloff.  
by J. A. Watson. atty.



# UNITED STATES PATENT OFFICE.

I WAN ORLOFF, OF ST. PETERSBURG, RUSSIA.

APPARATUS FOR LIFTING OFF AND REMOVING SHEETS FROM A PILE.

SPECIFICATION forming part of Letters Patent No. 696,186, dated March 25, 1902.

Application filed September 7, 1899. Serial No. 729,760. (No model.)

*To all whom it may concern:*

Be it known that I, IWAN ORLOFF, a subject of the Russian Emperor, residing at St. Petersburg, Russia, have invented new and  
5 useful Improvements in Apparatus for Lifting off Sheets of Paper and Removing Them from a Pile, of which the following is a specification.

My invention relates to that class of sheet  
10 lifting and removing apparatus which work pneumatically, and it may be applied for several purposes, especially for delivering or supplying sheets of paper in printing-presses or in other machines for working paper.

15 The object of my invention is to provide a simple and yet reliable apparatus of the said kind, and I attain this object by conveniently combining the usual sucking action with a bulging action.

20 My invention is based on the fact that the top sheet of a pile can be best lifted by bulging the corner or edge of the same by gentle pressure, with the finger slightly dampened for this purpose—that is to say, by subjecting the  
25 sheet to a rubbing action from the edge toward the inside under slight pressure applied by the finger. While hitherto this bulging of the paper when made use of in sheet-lifting apparatus has been always performed by  
30 similar means, as with the hand, so that these means are generally designated as fingers, the present invention essentially differs therefrom in that although bulging is made use of in connection therewith it is effected by  
35 means essentially different from a mechanical finger—viz., by suction.

In Figures 1 to 5 of the accompanying drawings the novel apparatus is illustrated in different stages of working, Figs. 1<sup>a</sup> and 1<sup>b</sup>  
40 showing modified details thereof. Fig. 6 is a plan view of the apparatus. Fig. 7 shows the same in connection with the impression-cylinder of a printing-press for feeding sheets to the print. In Figs. 8 and 9 I have represented modified forms of my apparatus, and  
45 in Fig. 10 the same in connection with the delivery apparatus of a printing-press for feeding offset-sheets between the printed sheets delivered. Fig. 11 shows a modified  
50 form of my apparatus serving the purpose of removing again the offset-sheets from a pile.

The pile of paper 1 is placed, as usual, on a

table 2, between fixed front stops or registers 3 and side stops 4, Fig. 6, adjustable according to the size of the sheet, and also, if necessary, between back-stops 5, likewise suitably adjustable. Above the front side of the pile of paper extends a suction-pipe 6, which is adjustable forward and backward and of a peculiar cross-section, Figs. 1 to 5. The  
55 shape of this pipe forms an essential part of my invention. The bore 7 of pipe 6 is connected with an air-pump or a vessel in which is kept a vacuum, the said connection consisting of a flexible tube or a hose-pipe provided with a valve in such manner that  
60 when the valve is opened the atmospheric air rushes in through a series of narrow channels 8 in the bottom of the pipe and in the position of the latter represented in Figs. 70 1 and 2 by sucking action draws up the uppermost sheet of the pile so that the edge of such sheet is closely pressed against the lower surface of the pipe, Fig. 2, and the edge projecting beyond the pipe is simultaneously withdrawn from under a flap or  
75 spring 9, bearing against the utmost edge of the pile of paper. The pipe 6 is now raised vertically or the table 2, with the pile of paper, is lowered, as supposed in the drawings, 80 the uppermost sucked-up sheet assuming, successively, the positions shown in Figs. 3 and 4, while the flap or spring 9 in the position of Fig. 3 prevents the withdrawing of several sheets simultaneously, as any sheets that  
85 may adhere to the sucked-up sheet are held back on their edge or stripped off from the uppermost sheet by means of the flap or spring. Pipe 6 then performs an oscillating movement, Fig. 5, in order to forward the  
90 lifted sheet to a delivery-table or bring it within the reach of a carrier to release the sheet and then assume again its initial position over the pile of paper, Fig. 1. For the purpose of releasing the sheet of paper the  
95 bore 7 of pipe 6 is timely and temporarily connected with the atmospheric air or with a receptacle containing compressed air, so that the sucked-up sheet falls down or will be repelled from the pipe. This can be effected  
100 by conveniently controlling the above-mentioned valve provided to this purpose with multiple ways or by means of a separate valve. The said means can be dispensed



with if the sheet be delivered to a gripper device, so as to be positively grasped and stripped off from the suction-pipe.

A general description of the working of my invention having been given, the details which form its object now will be described.

As appearing from the cross-section of pipe 6 its working bottom surface is double-curved outward at 10 and inward at 11, the convex portion 10 lying on the paper in the initial position of the pipe, Fig. 1, until the free edge or border of the top sheet is drawn or sucked up, Fig. 2. In consequence thereof a depression is formed below the portion 10, and the sheets are ventilated or loosened at the free end to a certain depth of the pile upon the successive strokes of the pipe coming into contact with the pile of paper, the entering of air between the sheets thus being permitted. By these means the borders of the ventilated sheets assume at the same time a double-curved form, the curvature being the greatest in the top sheet and becoming less gradually until at a certain depth it fully disappears. This double curvature, however, is nothing else than the first stage in an incipient bulging, precisely as effected if the thumb and forefinger be laid on the edge of the paper and a stroking action inward be commenced with the forefinger under a slight pressure and with the thumb pressed onto the paper. The formation of such a bulging, however, is practically the best means of separating one sheet from another, and as now the bulging is completed by means of the air-suction the top sheet at its edge is fully separated from the following sheet, being closely pressed against the concave portion 11 of the pipe, Fig. 2. Thereby the front free edge 12 of the sheet, Fig. 2, is bent downward, pushes away the following sheets, and thus further assures the separation of an individual sheet. Moreover, the spring or flap 9, bent upward at its end, co-operates in producing the same effect, as it bears against the outermost edge of the sheets and as soon as the top sheet undergoes the slightest withdrawal from under the flap the latter acts as a brake or check on the following sheets; but if at any time several sheets should be accidentally acted upon simultaneously the flap upon the pipe passing from the position in Fig. 2 to that in Fig. 4 strokes off and causes to fall back all sheets not to be lifted by suction. If it be desired to insure the individual separation of each sheet until the whole pile is worked off, an elastic or yielding intermediate piece is to be inserted between the pile of paper and the table, in order that the bulging of the sheet edge may be continued down to the final sheet. The portion 10 of the pipe does not need to be curved. It may be flat, as in Fig. 1<sup>a</sup>, or consist of a simple edge, Fig. 1<sup>b</sup>, provided only that while it lies on the pile of paper the portion 11 leaves free the edge of the pile of paper and the edge of the sheet to be clamped

at the back, but not in front. As concerning the channels 8, it has been found that the bulging of the sheets and their close contact with the surface 11 of pipe 6 are best effected when these channels are arranged obliquely to the pile of paper, so as to discharge near the passage of portion 11 to portion 10, for the reason that the bulging thus begins from inward—*i. e.*, the firmly-held portion of the edge—and is continued outward—*i. e.*, toward the loose portion of the edge—as, for instance, in order to apply the edge on surface 11 by means of the finger the stroking should be obviously performed in the direction from 10 to 11 and not in the inverted direction. Moreover, the resistance of the paper against bending is greater near the spot where it is firmly clamped than at its free end. Therefore the security against accidentally withdrawing a second sheet is greater when the suction action proceeds from inward to outward than in the inverted direction. However it has been found in practice that the described oblique arrangement of channels 8 is not indispensable, but appears desirable only for certain sorts of paper.

For the passage of the suction-pipe, with the adherent sheet, from the position Fig. 3 into the final position Fig. 4 it has been found most convenient to move it vertically with respect to the pile of paper, as supposed in the drawings, and as it is at the same time of the greatest importance that in their initial position the pile of paper and the suction-pipe assume just the position illustrated in Figs. 1, 2—that is to say, the edge of the sheet not being clamped on two lines—it is desirable, in order that these conditions may be permanently maintained, that upon the passing of the parts from the position in Fig. 2 into that shown in Fig. 4 the suction-pipe should be kept stationary and an upward-and-downward movement be imparted to the table only. By these means, too, complicated movements for the table as well as for the suction-pipe are avoided, as the table simply moves up and down and is stopped in its upward movement by the stationary suction-pipe, while the latter is merely moved out of its position of rest, Figs. 1, 2, 3, 4, to the delivery-table or within the reach of a carrier and back again into its position of rest, which can be accomplished by a reciprocating, an oscillating, or a revolving movement.

Fig. 7 shows the invention applied to a printing-press for automatically feeding the sheets, the suction-pipe assuming its delivery position, in which the sheet of paper is to be released from the suction-pipe and carried along by means of a suction-channel 13 or by grippers 13', pivoted to the impression-cylinder 14.

When securing the suction-pipe to rocking arms and arranging the rock-shaft laterally with respect to the pile, as represented in Fig. 8, so that owing to the swinging movement the suction-pipe is raised a certain dis-



tance almost vertically with respect to the pile, no downward movement is to be imparted to the paper-table, the latter being only to be continuously pressed upward by means of a weight or a spring and its upward movement being temporarily locked during the oscillation of the suction-pipe. When placing the central shaft of the suction-pipe above the edge or border of the pile of paper, Fig. 9, so that either a swinging movement or an intermittent rotary movement can be imparted to the suction-pipe extending between the two disks 15, a vertically-reciprocating movement of the paper-table must be made use of. This arrangement is especially effective in securing the separation of individual sheets of paper, as the sheet undergoes a further bending around the portion 10 of the suction-pipe when it performs its movement. To this purpose it is desirable to continue the working surface of the pipe by means of a bent sheet-metal plate 16 or by staves, wires, or cords 17, which extend between the two disks. By providing a second suction-pipe 6<sup>x</sup> the intermittent rotary movement can be limited to half-rotations.

The arrangement represented in Fig. 9 can be advantageously employed for automatically supplying interleaf-sheets between the fresh-printed sheets when delivered from a printing-press in order to prevent offset on the delivery-drum and the delivery-tapes, as well as on the piled sheets, respectively, as shown in Fig. 10. The sheet 19, carried along by the impression-cylinder—say by means of suction at 18—and printed on its outside, is transferred to the delivery-drum 20—for instance, by suction at 21—when the suction-channels 18 and 21 are in the position 18' 21' (indicated by dotted lines) in order to be finally delivered by means of endless tapes 22. Before the drum 20 takes up the printed sheet the suction-pipe 6, with the sucked-up offset-sheet, and a second suction-channel 23 of drum 20 meet each other in the position 6' 23', (indicated by dotted lines,) and in this position the offset-sheet is transferred to the drum and then carried along by it. As then, as described, the printed sheet is received by the suction-channel 21 in its position 21', its printed side is secured against contact with the drum and with the tapes 22 by the offset-sheet, and in contact therewith it is finally delivered to the delivery-table by the tapes 22. Thus the printed sheets are piled above each other with an offset-sheet inserted between each two sheets, and consequently cannot soil each other. It will be obvious that instead of the suction-channels 18 21 23 the usual grippers can be made use of.

The great simplicity of the present apparatus, its extension and action being restricted to but one border or edge of the pile of paper, allows of several such apparatuses—say up to four—being applied to one and the same paper pile, so as to work together in a determined

succession to alternately grasp the sheets on the several four edges and remove them in four different directions. By these means a single pile of paper can be decomposed into four separate piles.

Fig. 11 illustrates a conveniently-arranged double-acting apparatus of the feature represented in Fig. 8, which, for instance, can be made use of for automatically removing offset-sheets from a pile of paper composed alternately of printed and offset sheets. To this purpose two suction-pipes 6 6<sup>x</sup> are fixed between two bars 24, pivoted to rocking arms 27 28 on rock-shafts 25 26. The paper-table 29, with the mixed pile 30, composed alternately of printed and offset sheets, is placed in the middle, and to the left and right there are placed tables 31 32, the one, 31, for receiving the printed sheets and the other, 32, for receiving the offset-sheets. In the position of the apparatus indicated by dotted lines the suction-pipe 6 takes off a printed sheet and carries it upon the next oscillation of arm 27 onto the table 31, where the sheet will be released. The suction-pipe 6<sup>x</sup> at the same time having reached the right-hand edge of the paper pile 30 the following sheet—that is, an offset-sheet—will be sucked up. If now pipe 6 swings back into its position represented by dotted lines pipe 6<sup>x</sup>, with the sucked-up offset-sheet, likewise swings back into its dotted position to deliver the offset-sheet on table 32. Meanwhile, however, the suction-pipe 6 has again sucked up a printed sheet on the left side of the pile of paper and upon its oscillation carries it on the table 31. Thus the mixed pile of paper 30 will be successively decomposed, the printed sheets being assembled into a pile on table 31 and the offset-sheets into another pile on table 32. It is obvious that any other of the movements described may be applied to the suction-pipes, provided that the sheets of paper be grasped alternately on opposite sides and accordingly delivered in opposite directions.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In apparatus for the purpose described, a pneumatic lifter consisting of a tubular body having in its lower face a recess 11 which communicates through suitable passages with the interior of the tubular body, and having at one side of said recess a downwardly-projecting portion 10 adapted, when the lifter is adjusted against the sheet to be moved, to force a portion of said sheet into the recess 11 and to be free from said sheet while the latter is being moved by the lifter.

2. In apparatus for the purpose described, a pneumatic lifter consisting of a tubular body having adjacent portions of its lower surface convex and concave, said body having a series of passages extending from said concave portion into the central bore, and the convexly-curved surface extending below the concave portion and adapted when



pressed against a pile of sheets to so depress the upper sheet as to force a portion thereof into the concaved portion of the lower surface of the lifter, and said convex surface  
 5 being out of contact with the engaged sheet while it is being lifted from the pile.

3. In an apparatus for the purpose described, the combination with a support for a series of sheets, of a pneumatic lifter adapted to engage the upper of a series of sheets  
 10 on said support, and a spring arm or plate, 9, pivoted at one side of said support and having its free end which rests on the upper sheet of the series bent or curved upwardly so as to offer no obstruction to the  
 15 movement of said sheet when reengaged by

the lifter and preventing other sheets in the series from following the one so engaged.

4. In an apparatus for lifting off and removing individual sheets from a pile, the  
 20 combination of a plurality of suction-pipes placed at different sides of the pile and arranged to alternately remove the lifted sheets in different directions, substantially as and for the purposes described. 25

In witness whereof I have hereunto set my hand in presence of two witnesses.

IWAN ORLOFF.

Witnesses:

JOHN EDWARD NEWTON,  
 LEONARD WALTER.