

No. 835,595.

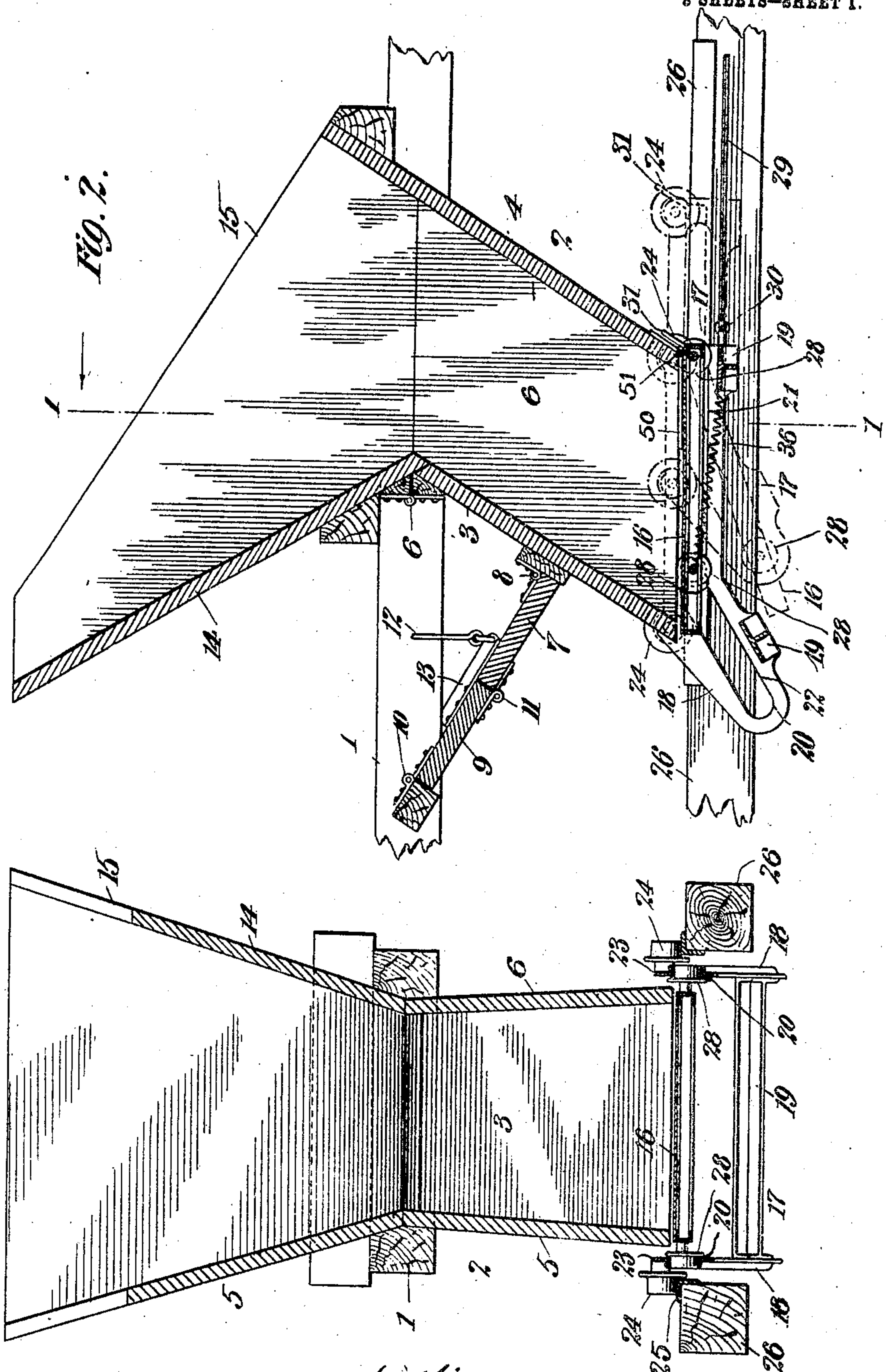
PATENTED NOV. 13, 1906.

W. A. BISHOP.
OUTLET GATE AND HOPPER.

APPLICATION FILED MAY 22, 1906.

8 SHEETS—SHEET 1.

Fig. 1.



Witnesses
James O. Brown
A. M. Hayes

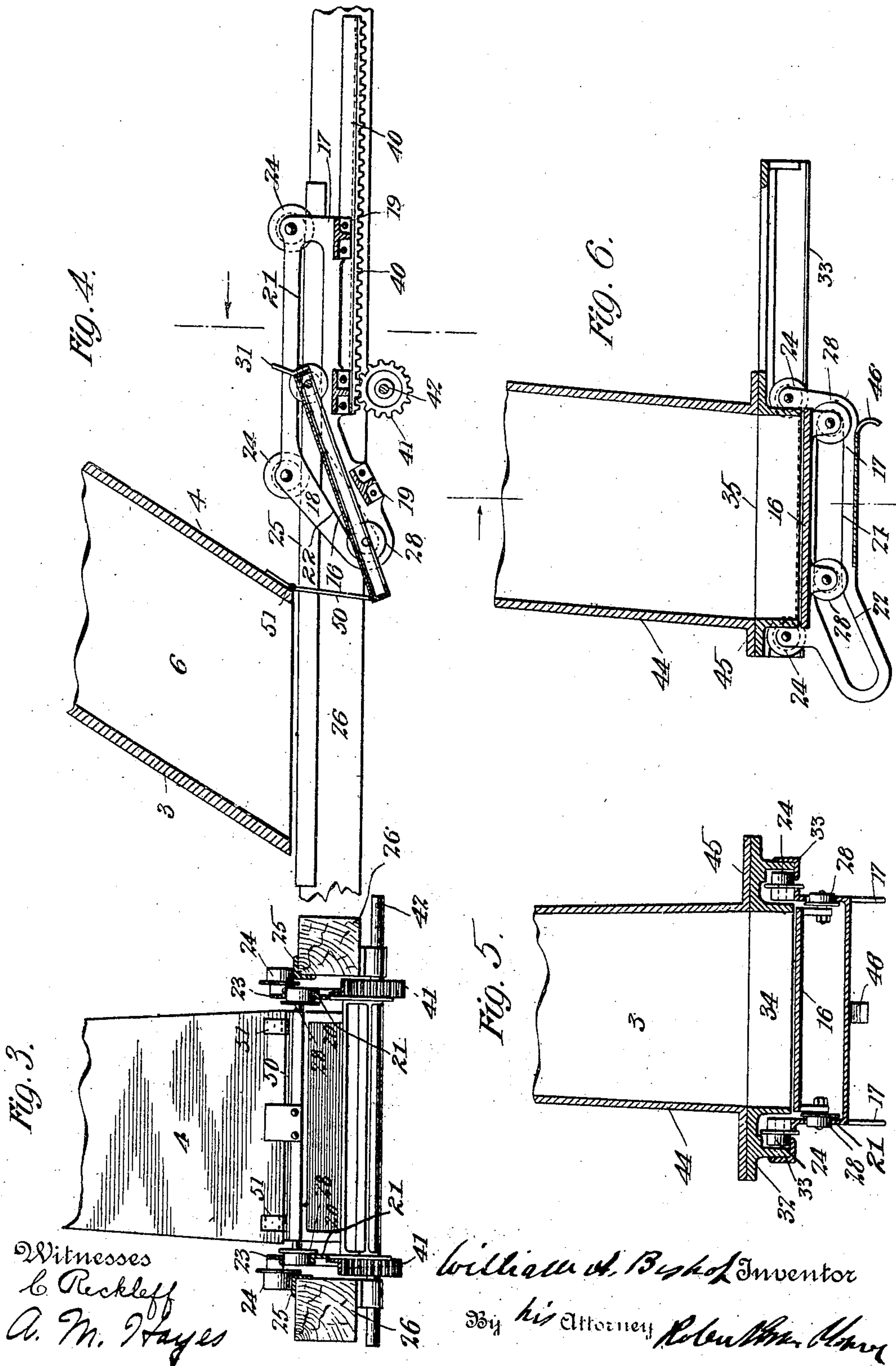
William A. Bishop Inventor
By *his* Attorney *Robert M. Brown*

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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

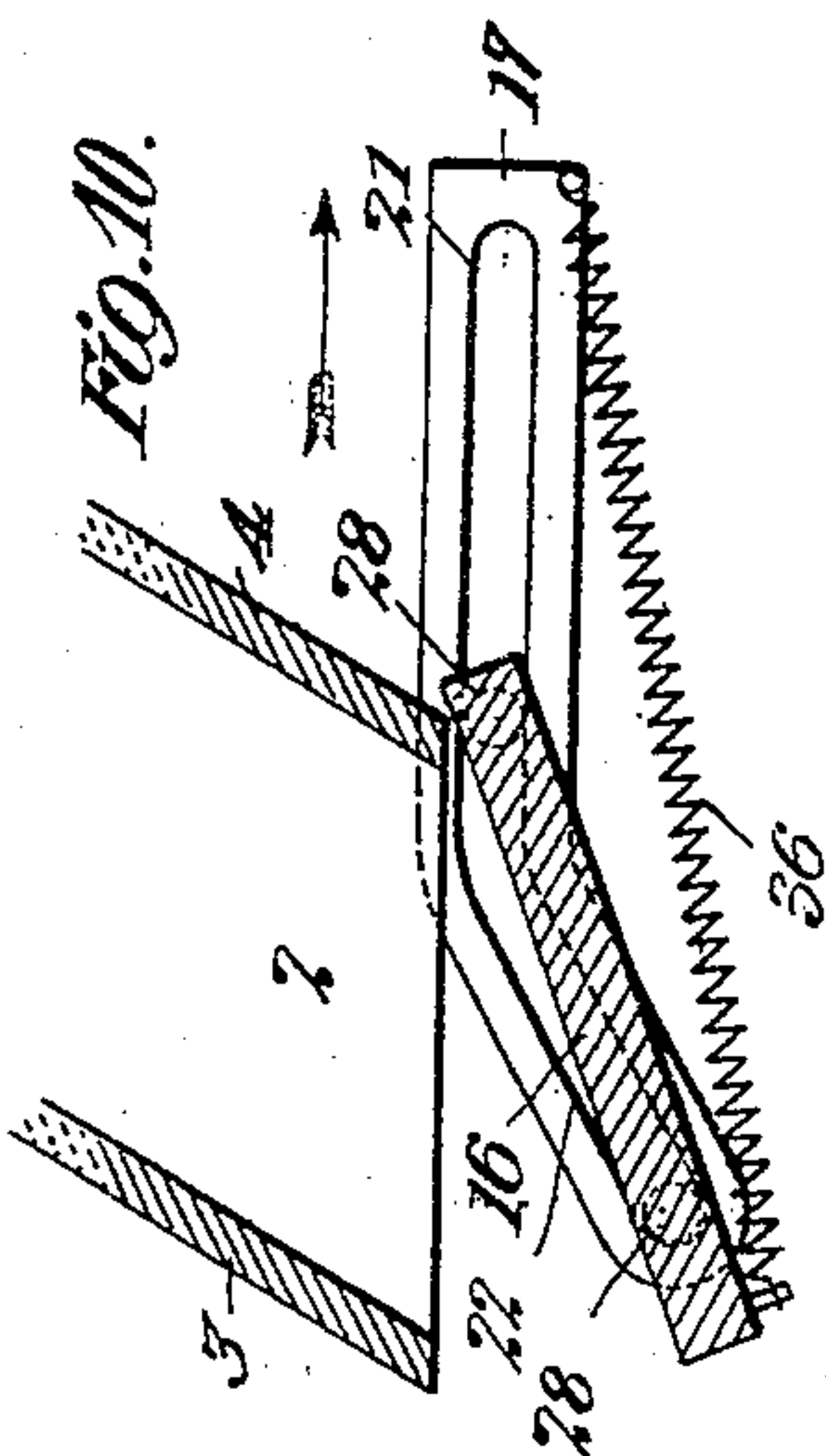


Fig. 10.

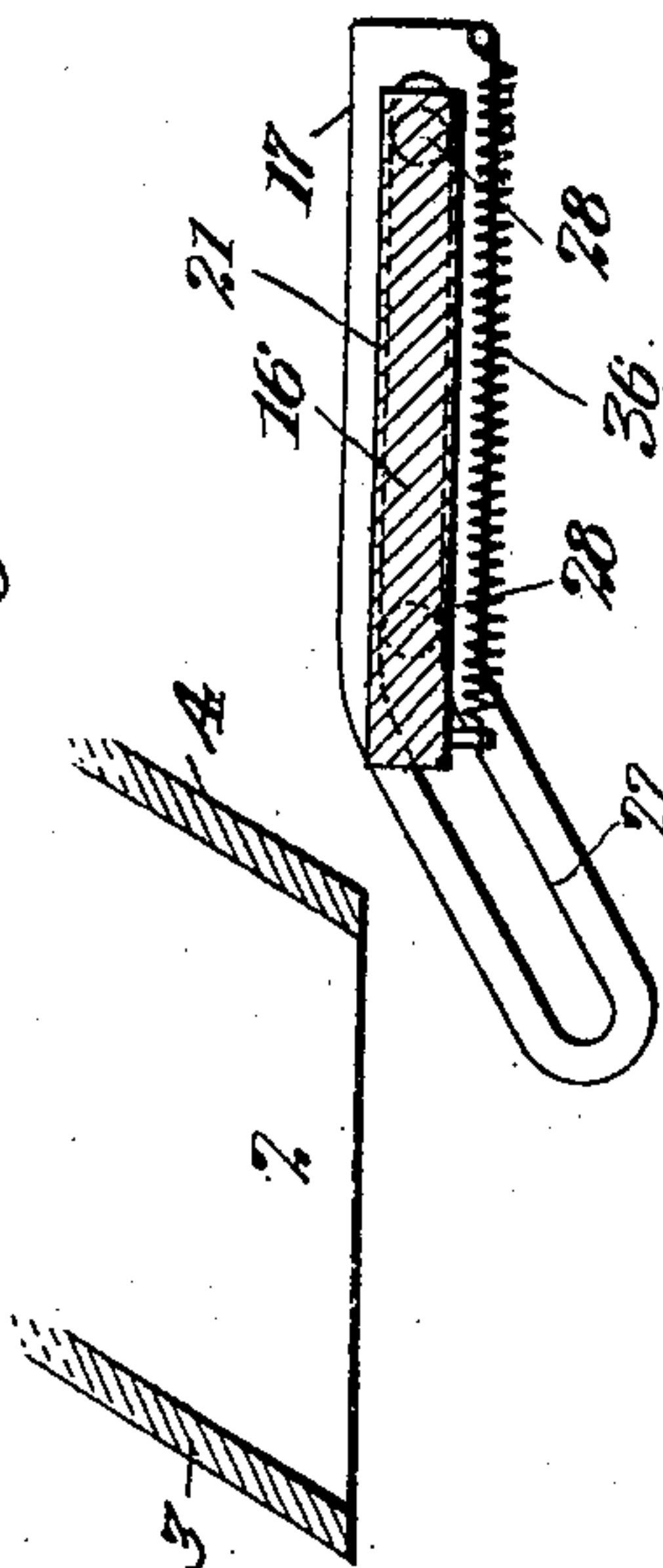


Fig. 11.

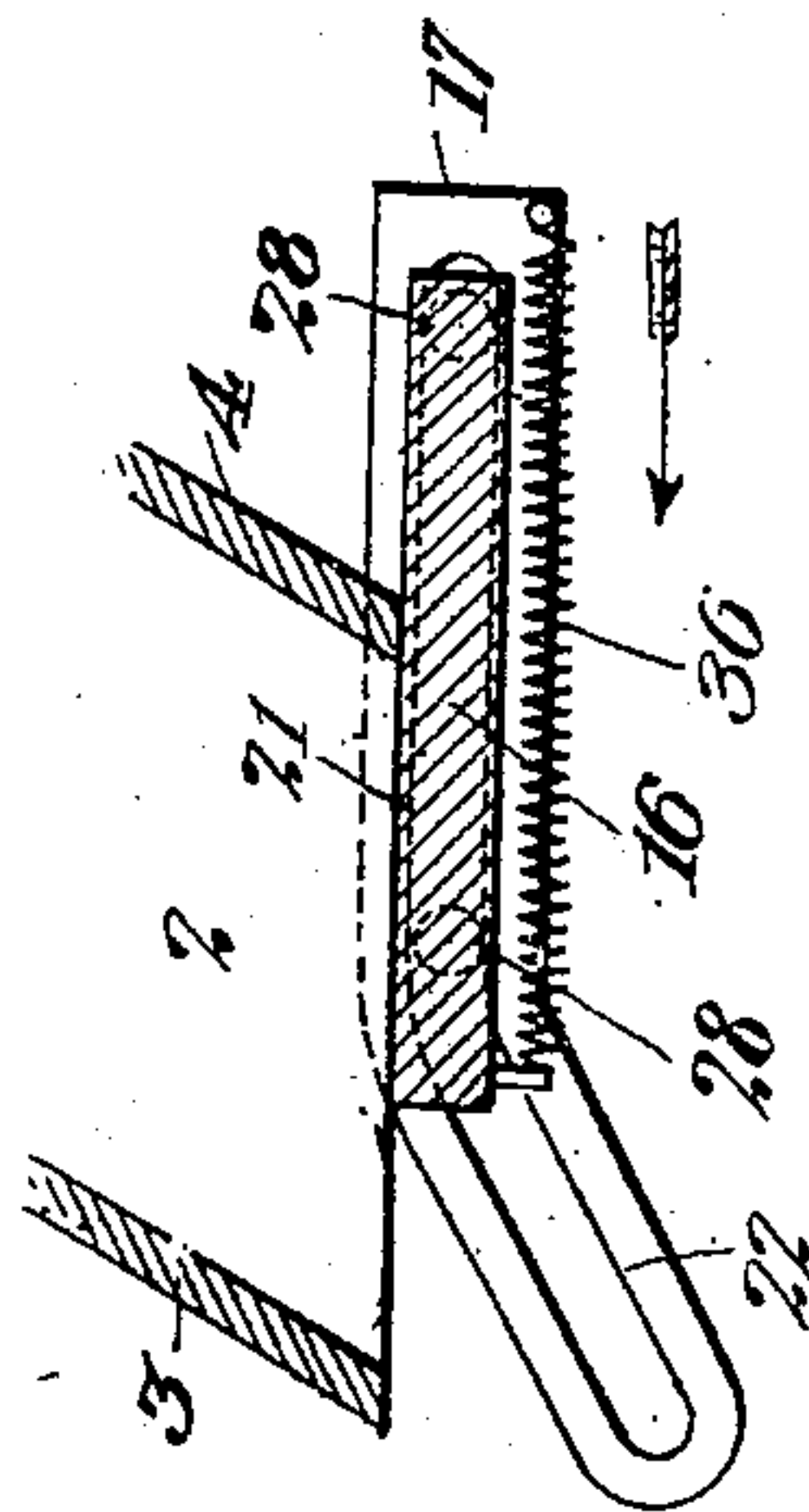


Fig. 7.

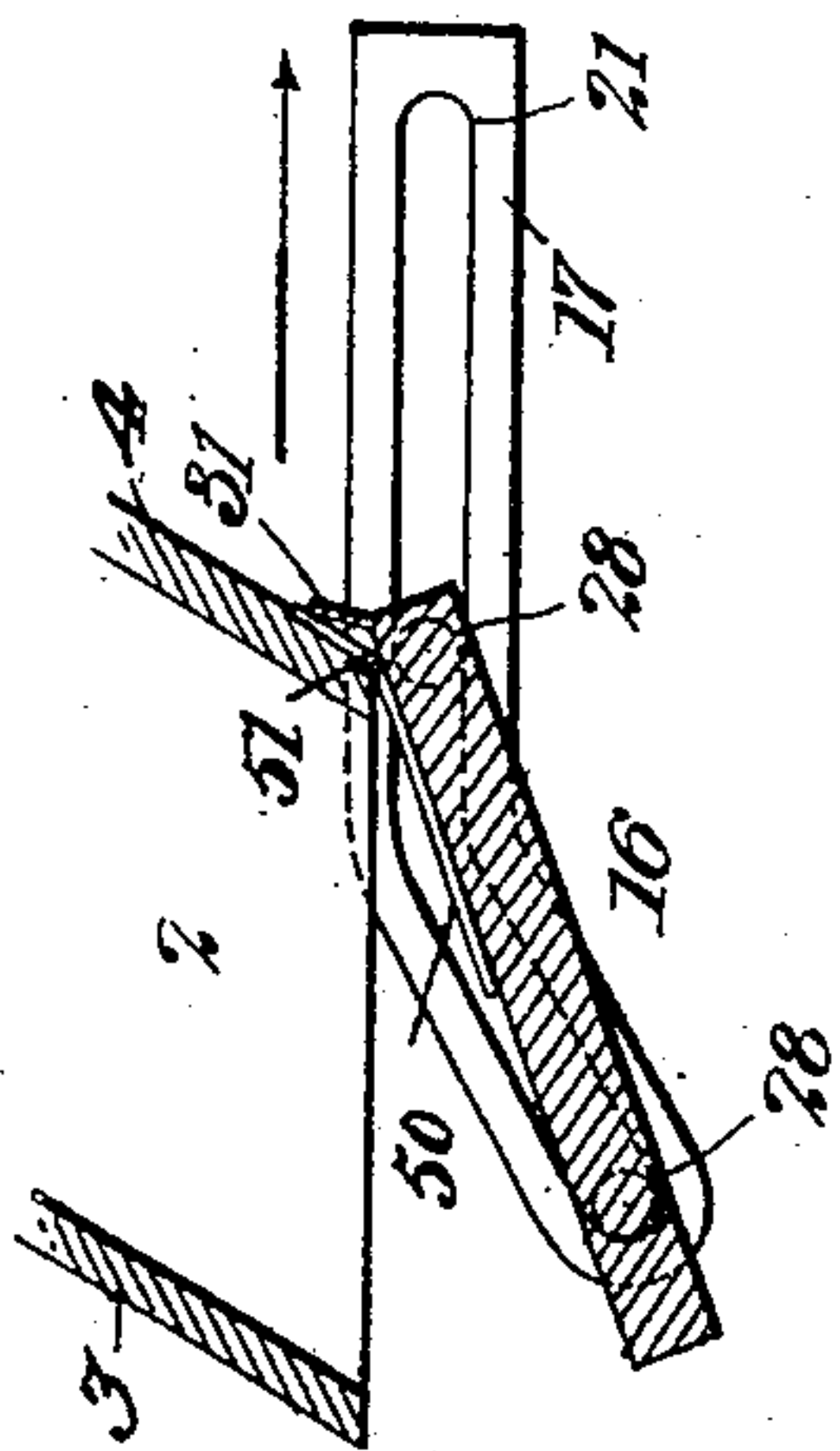


Fig. 8.

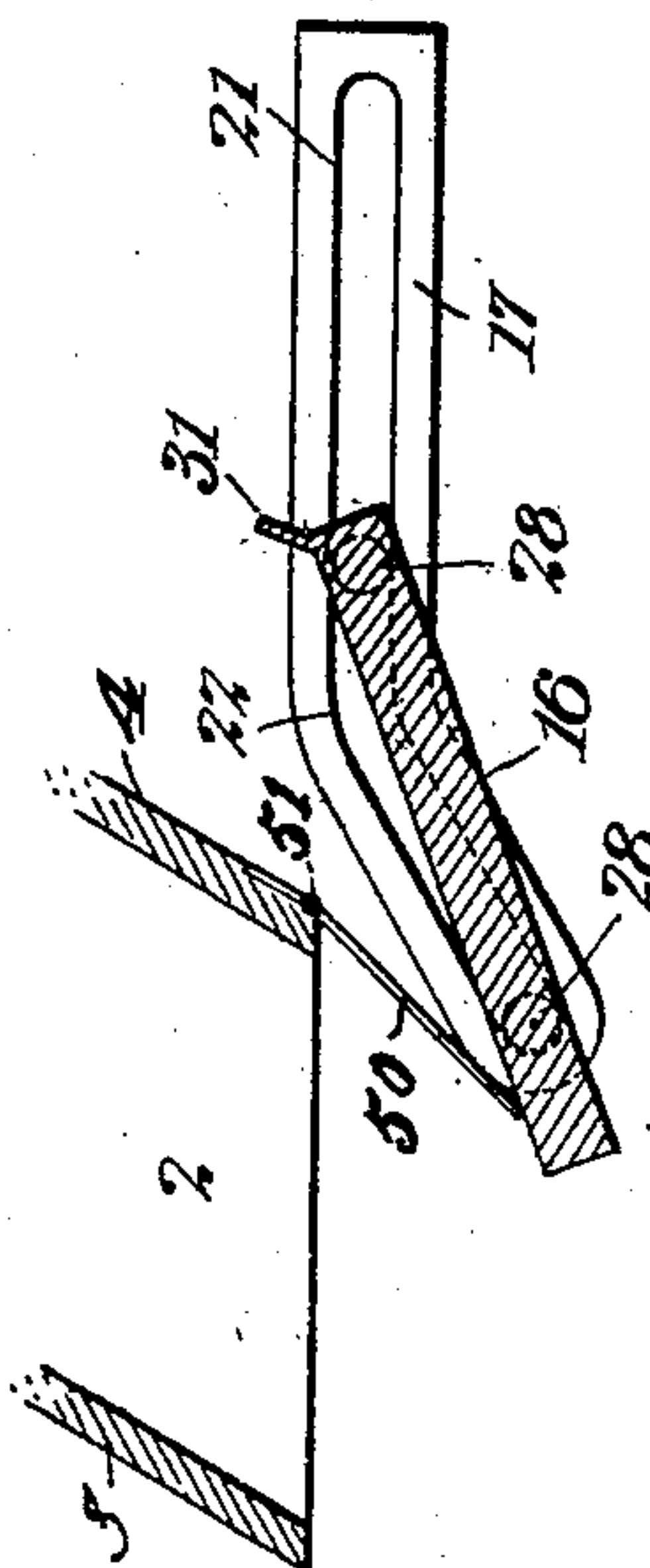
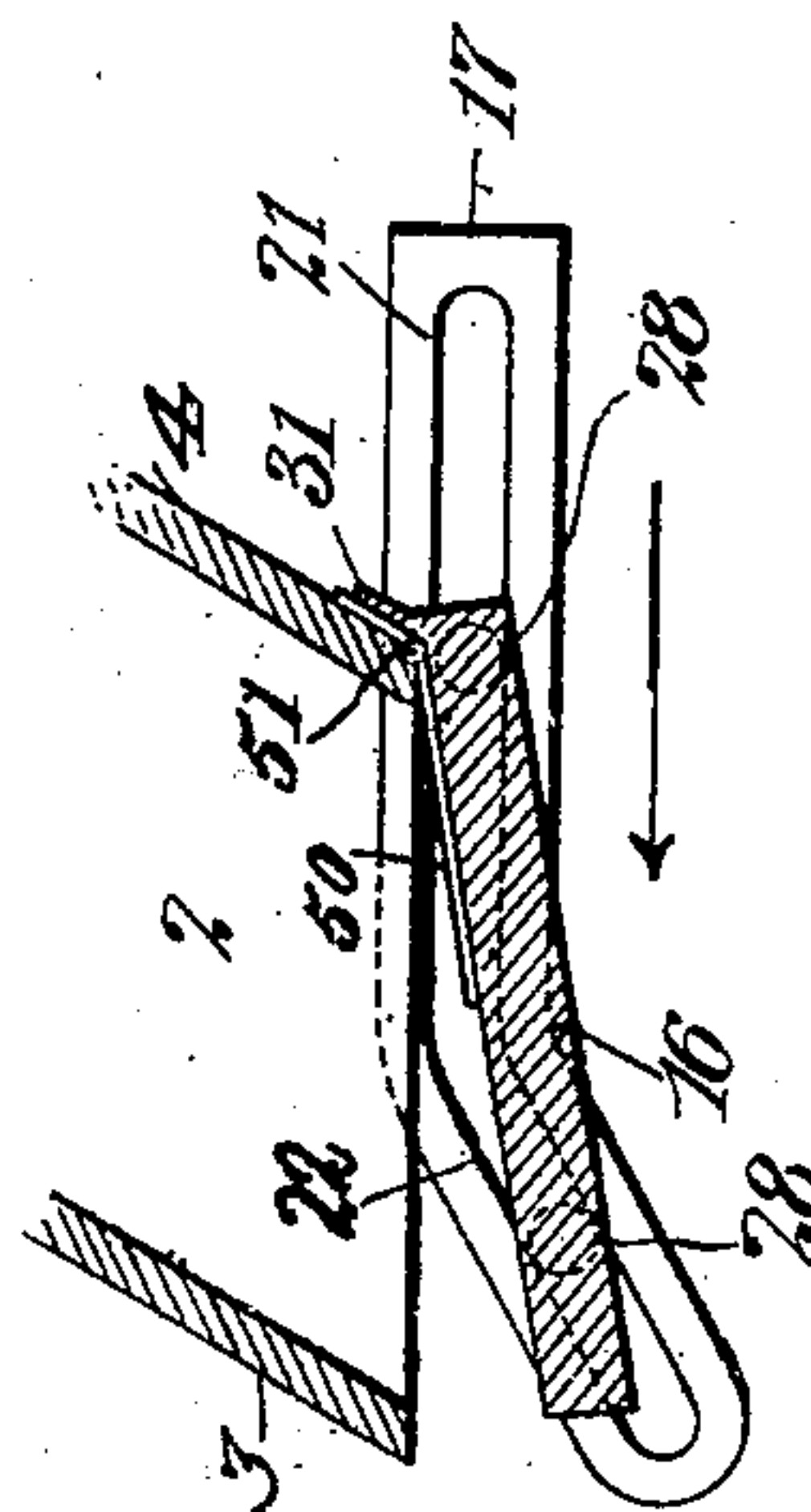


Fig. 9.



Witnesses
Hans Ober
A. M. Hayes

William A. Bishop Inventor
By his Attorney Robert H. Moore

UNITED STATES PATENT OFFICE.

WILLIAM A. BISHOP, OF NEWARK, NEW JERSEY, ASSIGNOR OF ONE-HALF
TO CALVIN TOMKINS, OF NEW YORK, N. Y.

OUTLET-GATE AND HOPPER.

No. 835,595.

Specification of Letters Patent.

Patented Nov. 13, 1906.

Application filed May 22, 1906. Serial No. 318,225.

To all whom it may concern:

Be it known that I, WILLIAM A. BISHOP, a citizen of the United States, residing at Newark, Essex county, State of New Jersey, have
5 invented certain new and useful Improvements in Outlet-Gates and Hoppers, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and
10 use the same, reference being had to the accompanying drawings, forming part of this specification.

Much difficulty has heretofore been experienced in the use of outlet-gates and in the
15 use of charging-hoppers having outlet gates or valves in handling large rough material, and particularly material having a tendency to arch or to stick or adhere to the parts of the apparatus, such as gypsum-rock, chalk,
20 rough asphalt, crude rubber, clay, &c.

My present invention is intended to overcome certain of the drawbacks to the hoppers and gates heretofore in use and to provide a device of this class in which the arching or
25 choking of the material within the hopper is prevented and a positive and smooth action of the gate or valve of the hopper is assured.

With these and other objects in view my invention consists in the various novel and
30 peculiar arrangements and combinations of the several different parts of the apparatus, all as hereinafter fully set forth and then pointed out in the claims.

I have illustrated types of my invention in
35 the accompanying drawings, wherein—

Figure 1 is a sectional view of my improved device, the section being taken on the plane indicated by the line 1 1, Fig. 2, transversely of the gate and slide. Fig. 2 is a central vertical longitudinal sectional view of the apparatus shown in Fig. 1 and with the carrier-slide and the gate shown in dotted lines as drawn backwardly about third-way of the range of movement of the carrier. Figs. 3
40 and 4 are end and longitudinal sectional views, respectively, of the form of apparatus shown in Figs. 1 and 2 and with racks and pinions for operating the slide and gate. Figs. 5 and 6 are similar views to Figs. 1 and 2, respectively, of a modified form of apparatus. Figs.
50 7 to 12, inclusive, are diagrams showing the relative positions of the parts in the operation of the gate and its carrier-slide.

Referring to the drawings, in which like

numbers of reference designate like parts 55 throughout, 1 is a supporting-framework, in which is mounted in depending position the hopper 2, which is shown as rectangular in horizontal section with the body thereof inclined downwardly at an angle of about sixty
60 degrees and with the front and rear sides 3 and 4, respectively, running substantially parallel with each other at this inclination. Each of the remaining sides 5 and 6, respectively, is inclined to the vertical, so that they
65 lie in diverging planes, and they form a downwardly and outwardly flaring chamber, this particular arrangement being adapted to prevent any possible arching of coarse rough material in the hopper. The side 3 of the
70 hopper, which may be termed the "forward" one and which is inclined outwardly relatively to the body of the hopper, is hinged at 6 at its upper end so that this entire side may be swung outwardly as far as necessary in case
75 any of the material within the hopper sticks or adheres to the sides thereof, so that complete access may be had to the interior for clearing it out. This hinged side 3 is securely locked in closed position by means of
80 a toggle-joint formed by an arm 7, hinged to the side 3 at the point 8, and an arm 9, hinged to the point 10 on a fixed piece on the framing 1, the two arms being hinged upon the under sides together at the point 11, so that
85 the toggle may be opened or raised by forcing upwardly both of the abutting ends of the arms 7 and 9, a link 12 being joined to a fixed piece 13 on the arm 9 for this purpose.

Above the hopper 2 is a chute-like structure 14, the main part of which is inclined
90 away from the upper end of the hopper in the opposite direction from which the hopper itself is inclined to the horizontal. This chute is used for guiding or deflecting the material into the hopper, the chute being cut
95 away at 15, so as to form practically a three-sided structure providing a comparatively large opening into which the material may be readily dumped without liability of it falling outside of the structure. 100

Beneath the lower open end of the hopper 2, from which the material is to be discharged, is arranged a gate or door 16, which is mounted in and has its movements controlled by a
105 horizontally-reciprocating carrier or slide 17. This carrier-slide is formed with two similar sides 18, secured rigidly together by suitable

cross-pieces 19, so as to form a skeleton structure, and each of the sides 18 is provided with a cam-slot 20, the main part 21 of which extends in the horizontal plane in which the slide operates, while the other or low part 22 of the cam-slot extends downwardly and forwardly at a desired angle, such as indicated in the drawings in Figs. 2 and 4. This carrier-slide 17 is supported upon hangers 23, four of which are indicated, two upon each of the opposite sides 18, and each hanger is provided with a wheel 24, running on a fixed track 25, which is fastened upon a stationary stringer or piece 26. This track is somewhat more than double the length of the horizontal portion of the carrier-slide and is two and one-half times the length of the discharge-opening of the hopper, measured in the direction in which the slide moves, and the parts are so related that in normal or closed position the carrier-slide stands well beneath the discharge-opening of the hopper, from which position it may be drawn backwardly, so as to either partially or entirely clear the opening in the hopper.

The gate or door 16, which closes the discharge-opening of the hopper, is mounted upon the rollers or wheels 28, two of which lie upon each of two opposite sides and travel within the cam-slots 20 of the adjacent side of the carrier-slide, the relative movement between the gate and the carrier-slide being substantially a tilting and horizontally-sliding movement. This gate 16 is carried directly beneath the discharge-opening of the hopper, so as to completely shut off the same when the gate is in normal closed position, as indicated in Figs. 1, 2, 5, and 6. The parts are so related that when the gate 16 is closed the carrier-slide 17 stands at its forward limit of movement, and the rear pair of rollers 28 of the gate lie at the rear end of the horizontal stretch 21 of the cam-slot, while the forward pair of rollers of the gate stand at the forward end of such horizontal part of the slot. (See Figs. 2 and 4.) As there is comparatively little friction between the gate 16 and the slide by reason of the antifriction-rollers 28, the weight of the material in the hopper bearing upon the gate serves to hold it in fixed position as the slide 17 is drawn backwardly, which may be conveniently done by a pull-rod 29, connected with an eye 30, fixed on the back end of the slide. As soon, however, as the slide is drawn back a slight distance the downwardly-inclined or low part 22 of the cam-slot in the slide is presented to the forward pair of rollers 28 of the gate, and this causes the forward or discharge end of the gate to be gradually depressed, and thereby opened by the superimposed weight of the material. This downward angular movement of the gate on the axis of its rear pair of wheels 28 as a center of motion continues until the forward wheels 28 thereof

reach the closed end of the cam-slot, at which time the slide has moved backwardly about a third of its range of movement, while the gate has not been translated horizontally, though it has been swung open, as indicated in dotted-line position thereof, Fig. 2, and in thus opening the gate, which for some purposes may be sufficient, both the weight of the load on the gate and the action of the cam-slots in the slide on the gate are utilized. Moreover, the gate when opened this distance is held securely in position by the engagement of its forward rollers with the closed end of the cam-slot.

In Figs. 3 and 4 the sliding carrier of the gate is shown as being provided with fixed racks 40, one located upon either side of the structure, and which racks are engaged by pinions 41, respectively, the pinions being fast on a shaft 42, which may be operated by hand or in any suitable manner. The turning of this shaft in one direction serves to draw back the carrier either to its full open position, as shown in Fig. 4, or to any point between such extreme position and its closed position. The reverse movement of the shaft 42 will feed the racks in opposite direction and return the carrier with the gate and finally close the same.

In the diagrams in Figs. 7 to 9, inclusive, the complete operation of the gate is fully shown. In Fig. 7 the relative positions of the parts are similar to the dotted-line positions shown in Fig. 2, and in which positions the slide stands at about the one-third point of its full traverse. As the slide is moved back to its extreme limit, as shown in Fig. 8, the gate maintains its inclined position, but is carried back entirely clear of the discharge-opening of the hopper, so that it does not in any way obstruct the discharge therefrom. The gate may be gradually closed by returning the slide from its extreme open position (shown in Fig. 8) to its normal position, (shown in Fig. 2,) and in this movement the gate 16 will remain in its downwardly-inclined position until the finger or stop 31 on the back end of the gate takes against the edge of the rear side 4 of the hopper, as shown in Fig. 9, and this serves to hold the gate from further partaking of the forward motion of the slide, the continued forward motion of which begins to elevate and close the forward end of the gate by reason of the forward wheels 28 of the gate traveling upwardly in the inclined part 22 of the cam-slot, and this continues until the parts assume the positions shown in Fig. 2 in full lines.

In the modification shown in Figs. 5 and 6, respectively, the construction is better adapted for a smaller apparatus, and the gate is made self-contained by having the entire apparatus mounted on the frame or casting 32, having the concealed tracks 33 for the

wheels 24 of the carrier-slide 17 to travel in, the slide being dropped down well below the level of the tracks. This frame 32 is also provided with a downwardly - extending flange 34, surrounding the opening 35, which comes immediately beneath the discharge-opening of the hopper 2. This modified construction shown in Figs. 5 and 6 is designed more especially for a gate for smaller installations, which may be applied directly to the lower end of a chute or bin 44, on the lower ends of which is a flange 45, to which the flange of the frame containing the sliding carrier is secured. In this form the frame of the carrier is provided with a handle 46, by means of which the carrier-slide may be operated and adjusted into different positions of its range of movement.

It will be noted that after the gate 16 is depressed or dropped into its inclined position and then begins to travel rearwardly with the carrier-slide the surface of the gate acts like a withdrawing inclined plane, and as the pressure of the material in the hopper is gradually lessened the gate withdraws very easily, thus combining the positive opening action under load of a hinged drop-door with the features of an ordinary plain sliding gate or valve. An important advantage of this arrangement is that while the gate 16 acts somewhat as a hinged drop-door it does so without occupying the large space required for the operation of such a door, and it may also be closed without the difficulty incumbent upon the ordinary hinged door. Furthermore, an ordinary sliding gate cannot be used with certain materials, while there is no limitation in this respect in the use of the gate herewith shown.

In closing or returning the gate to its normal position either of two methods can be used. The gate can either be slid back under the hopper while dropped or lowered in the slide, in which case it is preferable to have the hopper empty, the lug or stop 31 on the back of the gate coming in contact with the edge of the hopper and holding it from further translation, while the slide continuing to move into closed position acts as a wedge on the gate and raises it. If it is desired to cut off the material flowing through the opening of the hopper, and particularly small-size stuff, the gate can be provided with a retracting-spring 36, (see Fig. 1,) which is secured between a fixed point on the under side of the gate and a fixed point toward the rear end of the slide 17. Normally this spring is not under tension, but is put under tension during the first movement of the slide, as indicated in the diagram in Fig. 10, in which the slide is at its half-way position on the backward movement when the gate is in full drop position. As the slide is moved back to its extreme position the gate clears the material passing from the hopper, and it be-

ing thus relieved of the weight the spring 36 acts to draw the gate 16 backwardly in the slide into horizontal position, as indicated in Fig. 11, and in which relative positions the slide may then be moved forward, carrying the gate in horizontal position and cutting off the flow of material, Fig. 12 showing the half-way closed position of the gate as it is carried back by the slide.

This improved form of gate may be readily modified in its construction to suit the requirements for different purposes, and it can be operated in different positions and of course may be made in any desired shape. By means of rubber or other suitable packing the gate can be made to control an opening, which can be opened and closed instantly from a full, clear, and unobstructed opening to one that is air and water tight. In operating the hopper I prefer not to fill the same above the level of the upper end of the hopper and below the chute 14, so as to avoid any liability of choking or arching of the material therein. The dimensions of the hopper itself may be made so as to hold a definite amount of weight or bulk of the material, or it may be made amply large, so that in practice the hopper would never be filled above the level of its upper end.

In using the term "swinging" as defining the movement of the gate 16 when its discharge end moves to open the hopper the term is intended to cover such movement whether the gate is or is not carried backwardly by the slide at the time such outward movement of the gate takes place, as in some cases the gate may recede with the slide at the same time the gate is being dropped down or depressed at its discharge end, thus combining a translating movement with a swinging or tilting one.

In order to scrape from the inner face of the gate 16 any material which may adhere thereto, I provide a depending swinging scraper 50, consisting of a plate of suitable material hinged at 51 to one side of the discharge-opening and in such position that the lower edge of the plate is constantly in contact with the upper surface of the gate, it being kept so by gravity and by the weight of any material resting upon or passing over the plate. When the gate is in normal closed position, the scraper-plate 50 lies flat against the gate, as shown in Fig. 1. As the gate tips downwardly the scraper-plate 50 follows after it, as shown in Fig. 7, and as the gate begins to recede in the backward movement of the slide the gate tends to tilt away from the back of the plate. Nevertheless, the edge thereof remains in contact with the upper surface of the gate. In this movement the scraper-plate will act to scrape any loose material from the upper surface of the gate and serve always to keep it clean. After the plate has effected this scraping of the gate, as

shown in Fig. 8, the scraper-plate then forms a continuation of the side of the hopper, to which it is attached, and allows the discharge material to slide over it.

5 It will be understood that in the use of this discharge gate or valve 16 the discharge-opening of a hopper or the like may be controlled at will and the sides of such opening regulated or varied, as desired, such regulation being shown in the various views, Figs. 7
10 to 12, inclusive. In such regulation of the sides of the opening, and consequently the amount of material discharged or flowing therethrough, any well-known means may be
15 used for holding the carrier-slide in fixed position.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

20 1. The combination of a discharge-opening, a gate for the said opening, means for swinging the gate open at its discharging end through a certain angular distance and then moving said gate backwardly, and means for
25 returning the gate to closed position.

2. The combination of a discharge-opening, a gate for the said opening, means for swinging the gate open at its discharging end through a certain angular distance and main-
30 taining said gate in its angular position and moving it backwardly, and means for returning the gate to closed position.

3. The combination of a discharge-opening, a gate for the said opening, means for
35 swinging the gate open at its discharging end through a certain angular distance and maintaining said gate in its angular position and moving it backwardly, and means for moving said gate forwardly in its angular position and gradually restoring it to its normal
40 plane to close the opening in the hopper.

4. The combination of a discharge-opening, a gate for the said opening, a carrier-slide in which said gate is mounted with a
45 sliding connection between the two, the discharging end of said gate also having an angular movement on said slide during the initial movement of the slide when drawn back and then partaking of the movement of the
50 slide as it completes its backward movement, the said gate being restored to normal position and closed by the return movement of the carrier-slide.

5. The combination of a discharge-opening, a gate for the said opening, a carrier-
55 slide in which said gate is mounted with a sliding connection between the two, the discharging end of said gate also having an angular movement on said slide during the initial movement of the slide when drawn back and being held by the weight of the material against translating movement until its angular movement is practically completed and then partaking of the movement of the slide
60 as it completes its backward movement, the

said gate being restored to normal position and closed by the return movement of the carrier-slide.

6. The combination of a discharge-opening, a gate for the said opening, a slide in
70 which said gate is mounted with a sliding connection between the two, the discharging end of said gate also having an angular movement on said slide during the initial movement of the slide when drawn back and then
75 in its angular position partaking of the movement of the slide as the latter completes its backward movement, the said gate remaining in its angular position as the slide begins to move back, and means for tripping or
80 holding said gate while the slide is returning to its normal position and thereby closing the gate.

7. The combination of a discharge-opening, a gate for the said opening and adapted
85 to be swung open or depressed at its discharging end, a slide mounted in suitable bearings, a sliding connection between said slide and gate acting to swing open or depress the discharging end of said gate as the slide
90 is drawn back and to close or restore the gate to normal position when the slide is returned.

8. The combination of a discharge-opening, a gate for the said opening and adapted
95 to be swung open or depressed at its discharging end, a suitably-mounted carrier-slide in which said gate is mounted to slide and by which it is carried, means by which the discharging end of said gate is opened or depressed by the backward movement of the
100 slide while the weight of material on the gate holds it from moving with the slide, the said gate being restored to normal position and closed by the return movement of said carrier-slide.
105

9. The combination of a discharge-opening, a gate for the said opening and adapted
110 to be swung open or depressed at its discharging end, a suitably-mounted carrier-slide in which said gate is mounted to slide and by which it is carried, means by which the discharging end of said gate is opened or depressed by the backward movement of the
115 slide while the weight of material on the gate holds it from moving with the slide and then moving said gate backwardly with the slide, the said gate being restored to normal position and closed by the return movement of said carrier-slide.

10. The combination of a discharge-opening, a gate for the said opening and adapted
120 to be swung open or depressed at its discharging end, a slide mounted in suitable bearings and provided with a cam device which is maintained in sliding connection with said
125 gate and adapted to both depress the gate at its discharging end when the slide is drawn back and to restore the gate to normal position when the slide is returned.

11. The combination of a discharge-open- 130

ing, a gate for the said opening and adapted to be swung open or depressed at its discharging end, a slide mounted in suitable bearings and provided with a cam groove or slot, sliding connections between said gate and cam groove or slot of the slide and acting to open or depress the discharge end of the gate when the slide is drawn back and to close or restore the gate to normal position when the slide is returned.

12. The combination of a discharge-opening, a gate for said opening, means for swinging the gate open at its discharging end through a certain angular distance and then moving said gate backwardly and comprising a slide with which the gate is in sliding connection, a spring for drawing said gate backwardly on said slide after the gate has assumed its angular position and while said slide is moving backwardly, and means for returning the gate to closed position.

13. The combination of a discharge-opening, a gate for the said opening, a carrier-slide in which said gate is mounted with a sliding connection between the two, the discharging end of said gate also having an angular movement on said slide during the initial movement of the slide when drawn back and then partaking of the movement of the slide as it completes its backward movement, the said gate being restored to normal position and closed by the return movement of the carrier-slide and a rack and pinion for operating said slide.

14. The combination of a discharge-opening, a gate for the said opening, and a pivoted scraper engaging the inner face of the gate for scraping material therefrom in the operation of the gate.

15. The combination of a discharge-opening, a sliding and tilting gate for the said opening, and a scraper constantly engaging the inner face of said gate for scraping material therefrom in the operation of the gate.

16. The combination of a discharge-opening, a sliding and downwardly-tipping gate for said opening, a swinging depending scraper mounted to one side of the opening and engaging with its lower edge the inner face of said gate and maintained in said en-

gagement for scraping material from the surface thereof.

17. The combination of a discharge-opening, a gate for said opening adapted to be swung open at its discharging end through a certain angular distance and then moved backwardly to clear said opening or partially so, means for so moving the gate and returning it to closed position, and a swinging depending plate mounted at the side of the opening toward which the gate is carried and having its lower edge in constant engagement with the inner face of said gate for scraping the material therefrom.

18. The combination of a hopper, a tilting and sliding gate for the discharge-opening in the hopper, and a swinging scraper-plate mounted to one side of the discharge-opening and having its lower edge in constant engagement with the inner face of said gate for scraping material therefrom, the said plate forming practically a continuation of one side of the hopper when the gate is drawn open.

19. A hopper inclined to the vertical plane and gradually enlarging in a downward direction for preventing arching or choking of the material therein.

20. A hopper provided with a discharge-opening and having part of its side adjacent said opening hinged, and means for locking said hinged part in closed position.

21. A hopper having a rectangular cross-section with two of its opposite sides parallel with each other and inclined to the vertical and the two remaining sides inclined outwardly in a downward direction.

22. A hopper provided with a discharge-opening and having part of its side adjacent said opening hinged at its upper end and swinging outwardly, and means for locking said hinged part in closed position.

In testimony whereof I have hereunto set my hand in the presence of the two subscribing witnesses.

WILLIAM A. BISHOP.

Witnesses:

SAMUEL J. ROSENSOHN.

A. M. HAYES.