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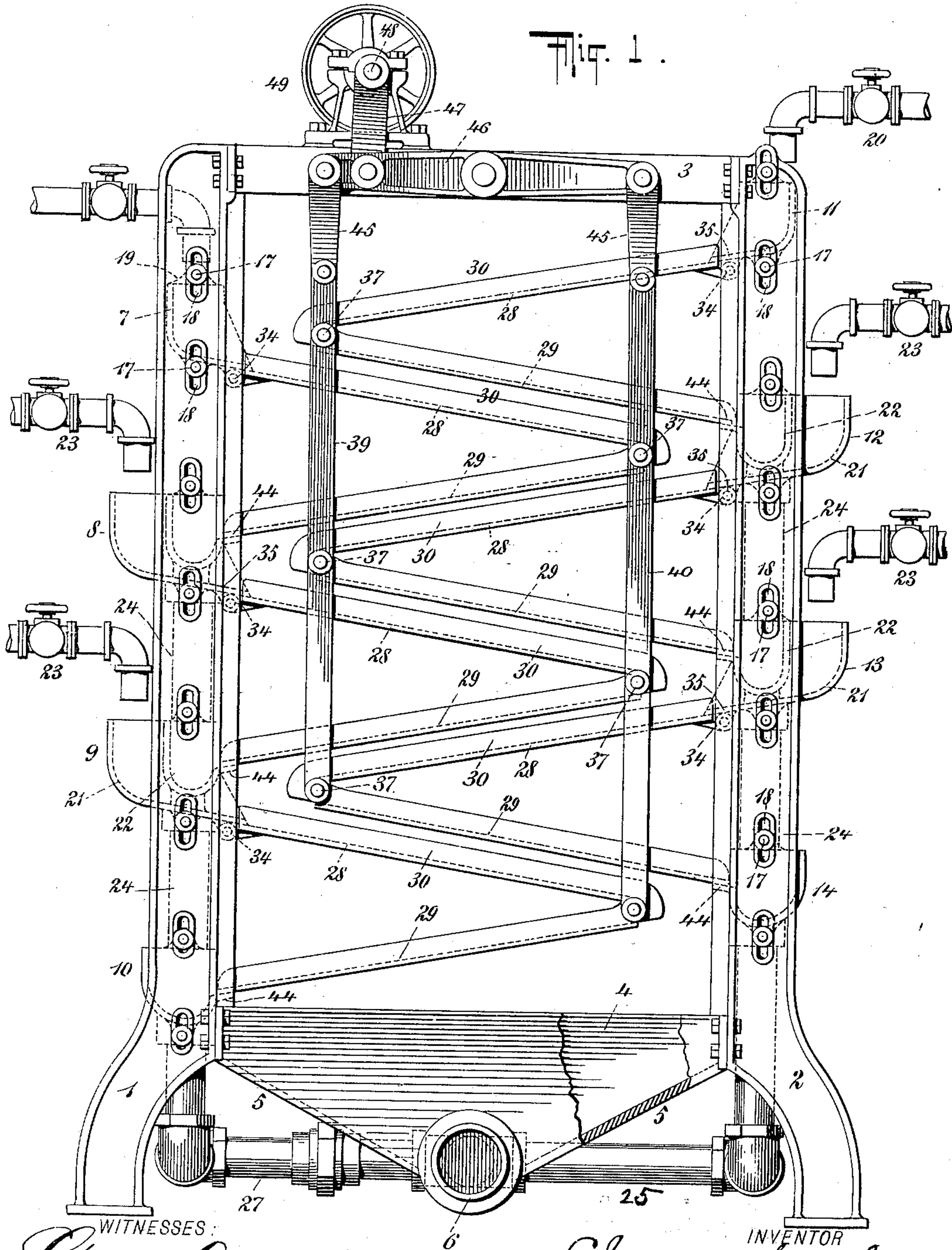
Patented Aug. 1, 1899.

C. SMITH.
MACHINE FOR SCREENING PULP.

(Application filed Oct. 8, 1898.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES:
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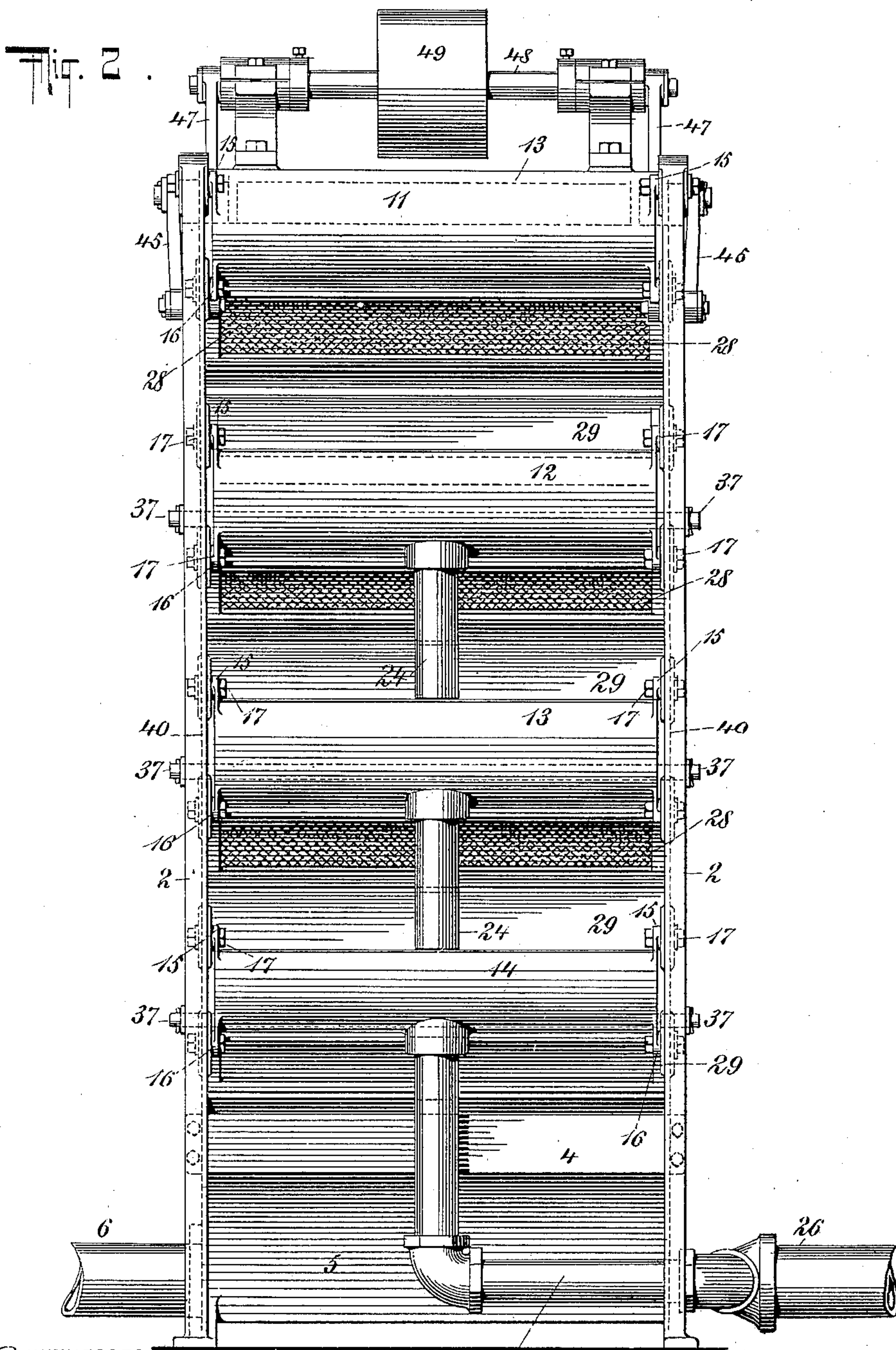
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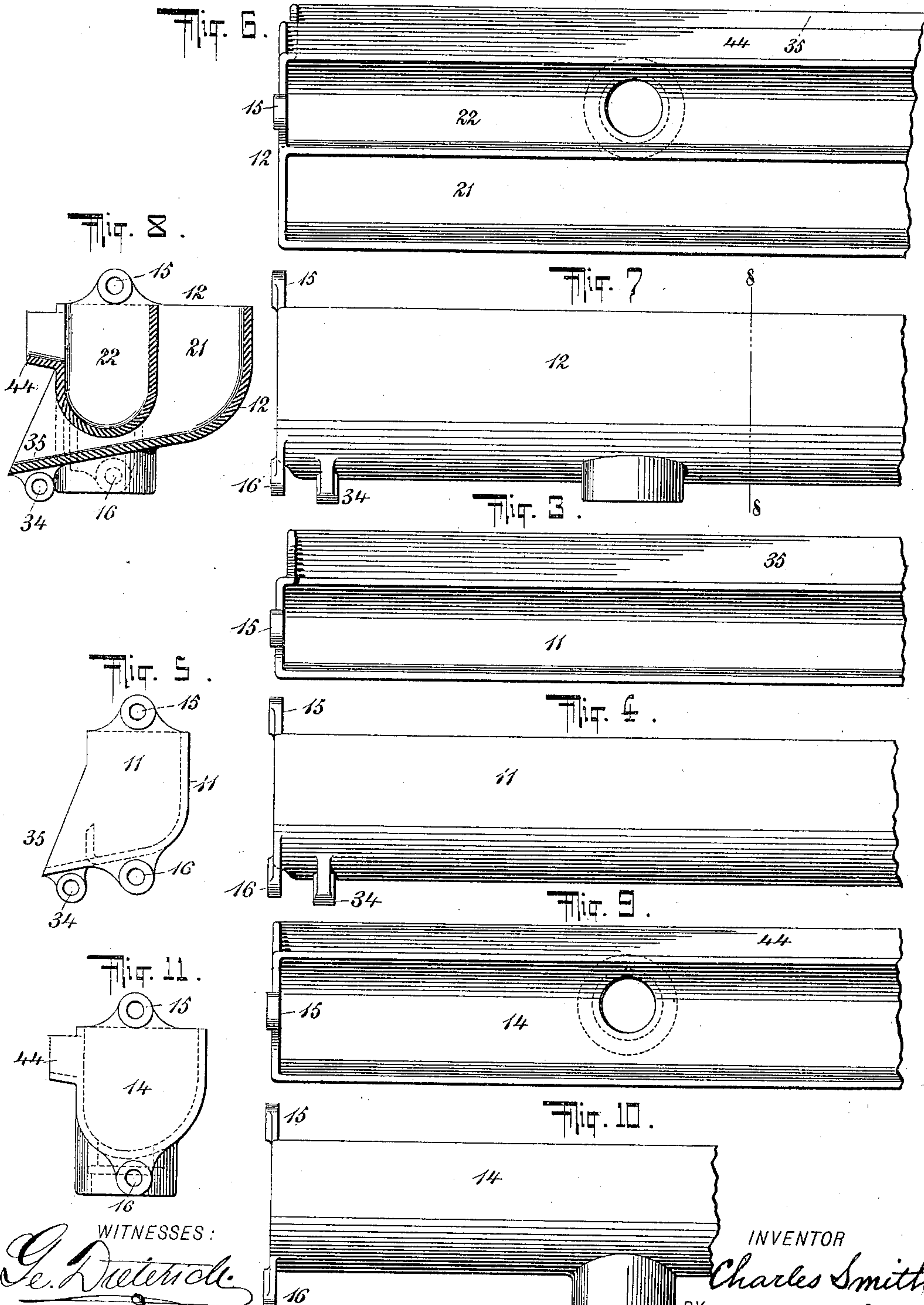
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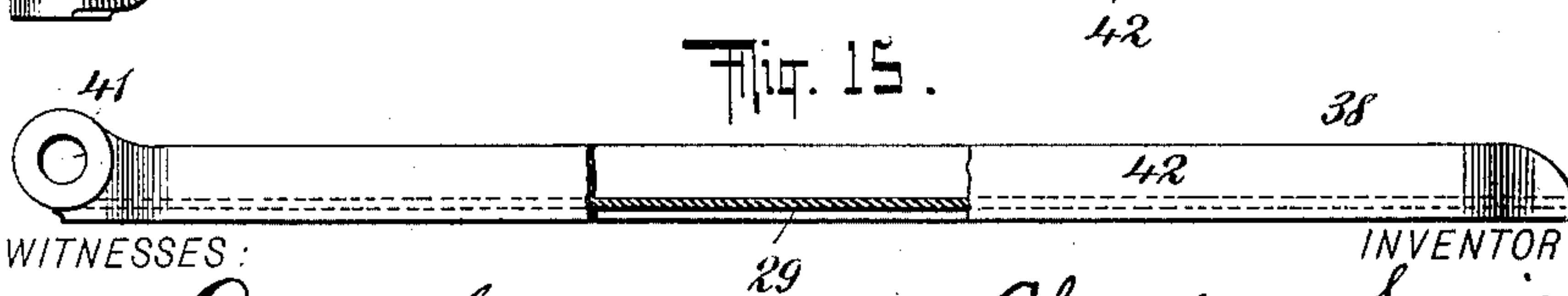
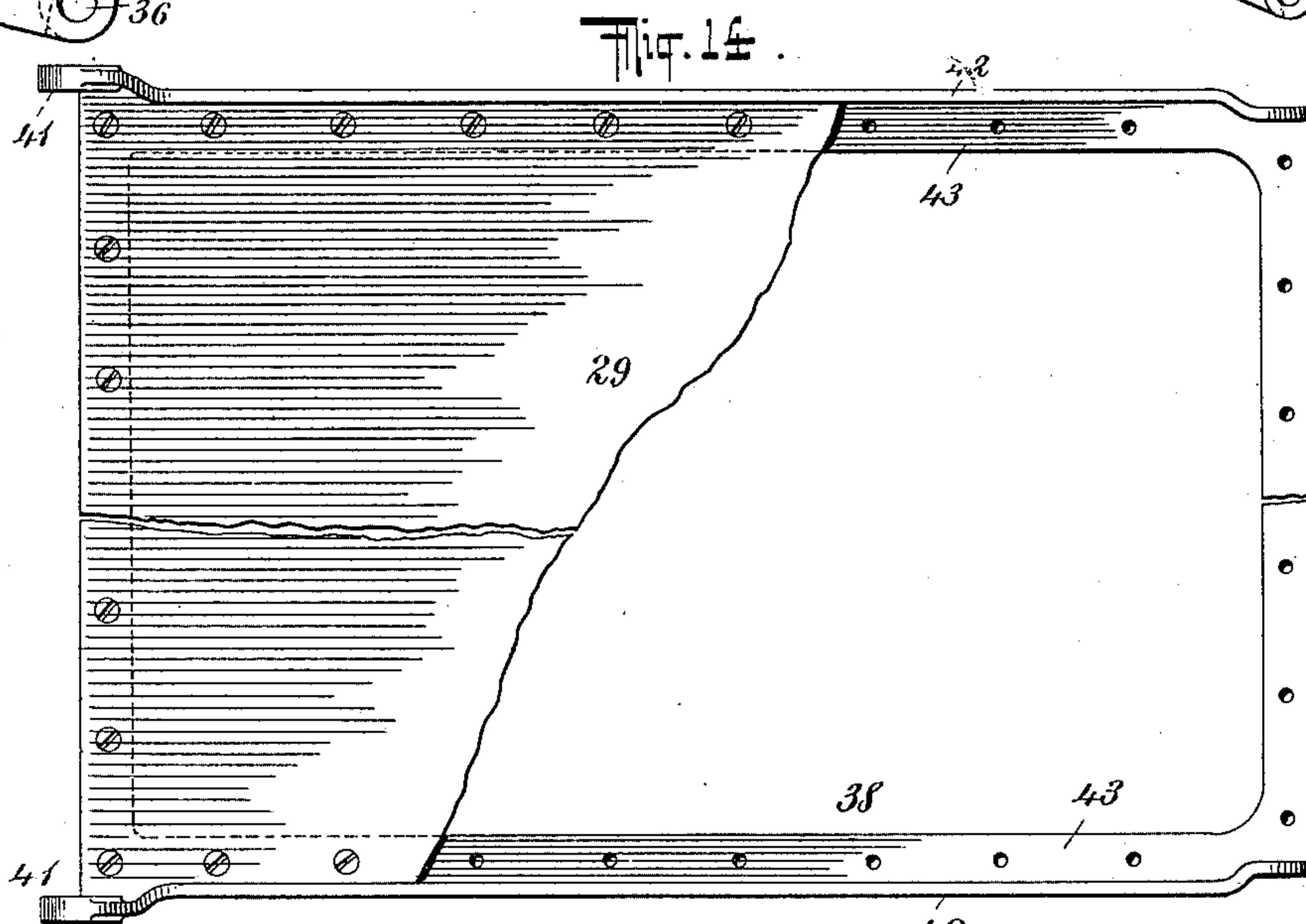
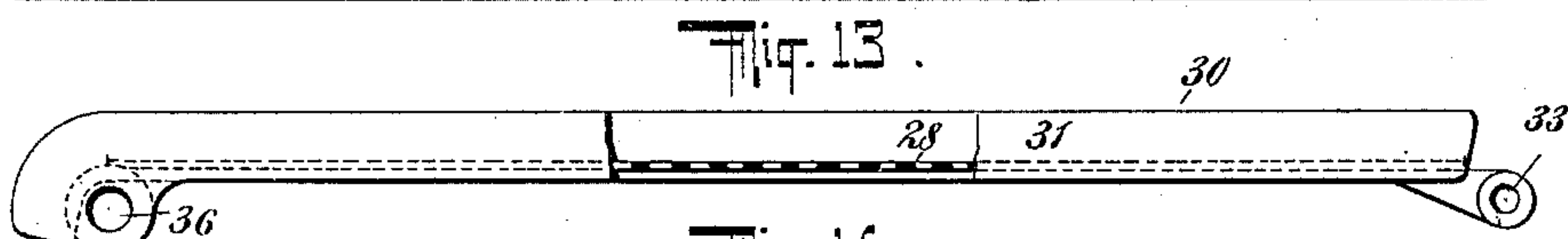
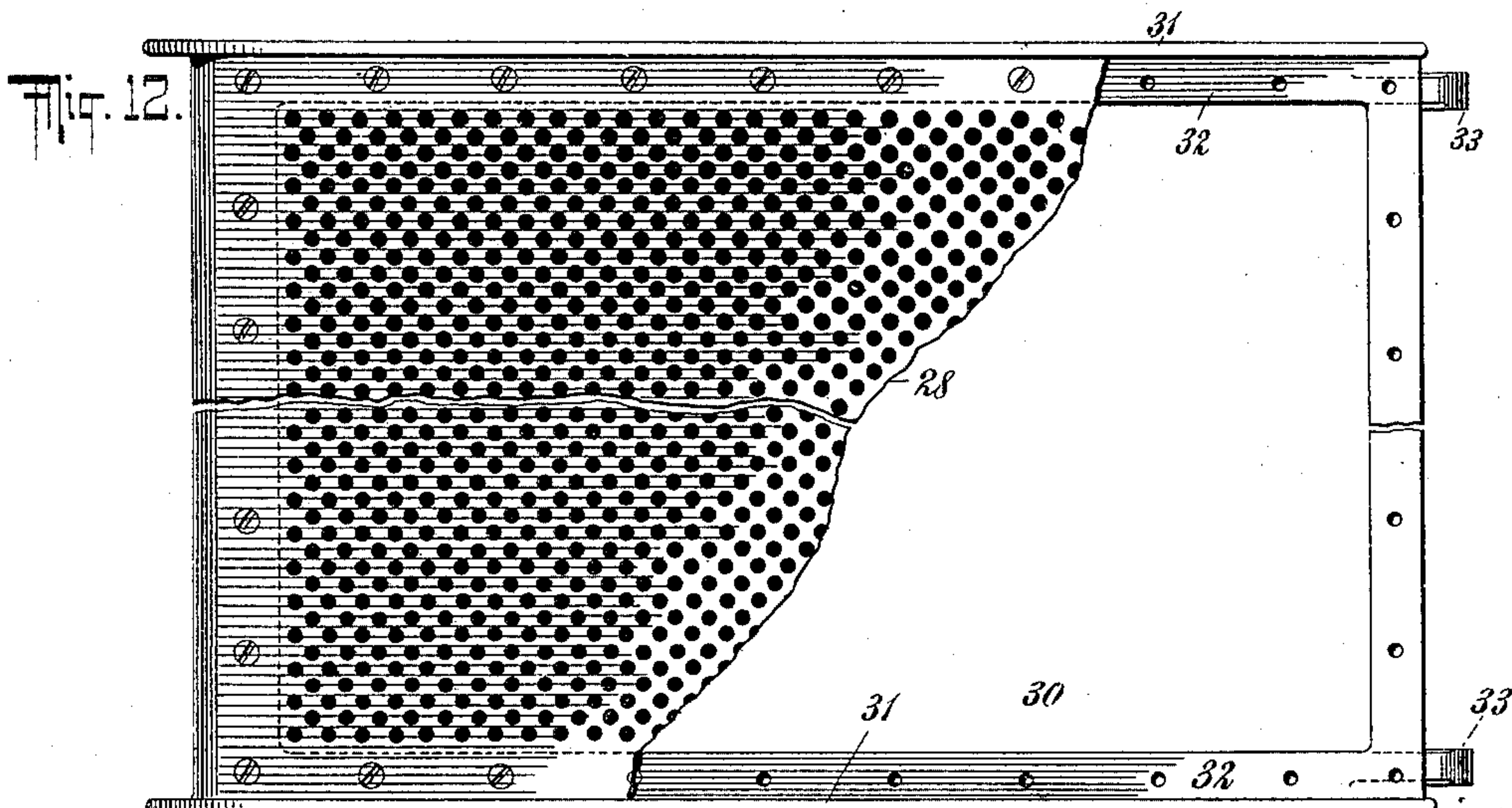
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4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

CHARLES SMITH, OF BELLEVILLE, NEW JERSEY.

MACHINE FOR SCREENING PULP.

SPECIFICATION forming part of Letters Patent No. 630,123, dated August 1, 1899.

Application filed October 8, 1898. Serial No. 692,986. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SMITH, a citizen of the United States, and a resident of Belleville, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Machines for Screening Pulp, of which the following is a specification.

The invention relates to improvements in machines for screening pulp, and pertains more particularly to machines for screening wood-pulp for use in the manufacture of paper.

In the manufacture of wood-pulp the pulp is taken from the usual grinder to the initial screen, when speaking of mechanical wood-pulp, and thence subjected to treatment on the machine made the subject of the present application, or when speaking of chemical wood-pulp the pulp is taken from the digester and thence subjected to treatment by the machine made the subject hereof. The pulp after having passed through the machine made the subject of this application is delivered to the "wet-machine" and prepared for commercial sale in the well-known form or delivered to the paper-making machines, as the mill-owner may elect. Ordinarily the pulp after treatment by the present machine and when utilized at once in the manufacture of paper is taken from the wet-machine and delivered to the "beater," where it is mixed with other pulp and other ingredients, and then delivered to the "stuff-chest," whence it is transferred to the regular paper machinery, whether of the cylinder or Fourdrinier type.

The object of the present invention is to produce a machine which will effectually, rapidly, and automatically screen the pulp with less water and labor than at present required in the screening of wood-pulp; and to this end the invention consists in the novel features and combinations hereinafter described, and particularly pointed out in the claims.

The invention will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation, partly broken away, of a machine constructed in accordance with and embodying the invention. Fig. 2 is an end view of same, taken from the right-

hand side of Fig. 1. Fig. 3 is a top view, partly broken away, of one of the upper two corresponding troughs which receive the wood-pulp and direct the same upon the screens. Fig. 4 is a side elevation of same. Fig. 5 is an end view of same. Fig. 6 is a top view, partly broken away, of one of the four intermediate troughs which in one compartment receive the screened pulp and in another compartment receive the pulp to be screened. Fig. 7 is a side elevation of same. Fig. 8 is a vertical transverse section of same on the dotted line 8 8 of Fig. 7. Fig. 9 is a top view, partly broken away, of one of the two lower corresponding troughs. Fig. 10 is a side elevation, partly broken away, of same. Fig. 11 is an end view of same. Fig. 12 is an enlarged top view, partly broken away, of one of the screens through which the pulp of proper grade passes and over which the pulp to be acted upon by the lower screens moves. Fig. 13 is a side elevation, partly broken away, of same. Fig. 14 is an enlarged detached top view, partly broken away, of one of the inclined plates located below the screens to receive the pulp which passes through the screens and conduct the same to the receiving-troughs therefor; and Fig. 15 is a side elevation, partly broken away, of same.

The machine is of general rectangular form, as indicated in Figs. 1 and 2, and comprises the corner standards or supports 1 2, which are connected at their upper ends by the horizontal beam 3 and at their lower ends by the receptacle 4, which is entirely open at its upper end and has the inclined converging bottom walls 5 5, leading to the outlet-pipe 6 for the pulp which has passed over the screens and contains splinters and other matter requiring the pulp to be subjected to the action of the refining-engine or to be reground.

Intermediate the corner-standards 1 1 are secured the series of troughs numbered 7 8 9 10, and intermediate the corner-standards 2 2 are secured the corresponding series of troughs numbered 11 12 13 14. The troughs 7 11 correspond with one another, the troughs 8, 9, 12, and 13 correspond with one another, and the troughs 10 and 14 correspond with one another. The form and construction of the troughs 7 11 are shown upon an enlarged scale in Figs. 3, 4, and 5. The form and con-

struction of the troughs 8, 9, 12, and 13 are presented on an enlarged scale in Figs. 6, 7, and 8, and the form and construction of the troughs 10 and 14 are illustrated on an enlarged scale in Figs. 9, 10, and 11.

The troughs numbered 7 to 14, inclusive, are each provided at each end with the upper and lower eyes numbered 15 16, respectively, by means of which and the bolts 17 said troughs are secured between the corner-standards 1 1 and 2 2, respectively, which standards, as illustrated in Fig. 1, are provided with the elongated slots 18 to receive said bolts 17 and permit of the vertical adjustment of the said troughs numbered 7 to 14, inclusive. The troughs 7 to 10 snugly fit between the standards 1 1, and each is independently adjustable in a vertical direction by means of the bolts 17 and slots 18. The troughs 11 to 14, inclusive, likewise fit snugly between the corner-standards 2 2 and are rendered adjustable in a vertical direction by means of the bolts 17 and slots 18. The purpose of adjusting the troughs 7 to 14, inclusive, is to effect the adjustment of the inclination of the screens hereinafter referred to and to retain said troughs in proper alinement with said screens to deliver the pulp thereto, as hereinafter more fully explained.

The upper troughs 7 and 11 have a single compartment to receive the pulp from the supply-pipes 19 20, while the troughs numbered 8 9 12 13, inclusive, have the compartments 21 22, as more clearly illustrated in Figs. 6 and 8, the compartments 21 being to receive the pulp from the supply-pipes 23 and direct the same upon the screens to which said compartments lead, while the compartments 22 in said troughs numbered 8 9 12 13, inclusive, receive the graded pulp which has passed through the respective screens and permit the delivery of the same to the vertical pipe-sections 24, which, as illustrated more clearly in Fig. 2, extend downward from one compartment 22 to the compartments 22 below and finally direct the pulp into the branch pipes 25 27, leading into the final delivery-pipe 26 for the pulp. The compartment 22 of the trough 12 is connected by the pipe-section 24 with the compartment 22 of the trough 13, and the compartment 22 of the trough 13 leads to the single compartment of the trough 14, and the trough 14 is connected by the branch 25 with the main delivery-pipe 26 for the screened pulp, as shown in Fig. 2 and by the dotted lines in Fig. 1, and likewise the compartment 22 of the trough 8 is connected by the pipe-section 24 with the compartment 22 of the trough 9, and the compartment 22 of the trough 9 is by a similar pipe-section 24 connected with the single compartment of the trough 10, which by means of the branch pipe 27 is connected with the aforesaid main delivery-pipe 26 for the screened pulp. The branch pipes 25 27 lead from the opposite ends of the machine to the one delivery-pipe 26, as indicated in Figs. 1 and 2, and the pipe

26 conducts all of the screened pulp from the machine, while the pulp which has not passed through but has moved over the screens enters the receptacle 4 and is delivered from the machine by means of the pipe 6. It will be observed upon reference to Fig. 8 that the troughs 8 9 12 13, inclusive, are so constructed that the pulp entering the compartments 21 from the supply-pipes 23 may pass below the compartments 22, and thus conveniently reach the screens.

Referring to Fig. 1, the screens are denoted by the numerals 28, and the inclined plates by which the pulp passing through the screens is caught and directed to the compartments 22 of the troughs 8 9 12 13 and to the single compartments of the troughs 10 and 14 are designated by the numerals 29, one of said inclined plates 29 being below each of the said screens 28, as shown in Fig. 1. The screens 28 are of perforated metal, as more clearly shown in Figs. 2 and 12, securely fastened at their edges to the metallic frames 30, which are of rectangular shape and are formed with the vertical sides 31 and transverse flanges 32. The screens 28 are secured to the flanges 32 of the frame 30, as shown in Fig. 12, and the sides 31 of the frames 30 constitute, with the screens 28, shallow troughs to receive the pulp leaving the supply-pipes. The frames 30 have at their upper ends the eyes 33, as clearly shown in Figs. 12 and 13, and these eyes by means of ordinary bolts are connected with the eyes 34, cast upon the troughs 7 8 9 11 12 13, inclusive, and clearly illustrated by dotted lines in Fig. 1 and by full lines in Figs. 4, 5, and 8, and thus the troughs 7 8 9 11 12 13, inclusive, support the upper ends of the screens, and since said troughs are independently adjustable, as above described, it is apparent that by adjusting the said troughs the inclination of said screens may be regulated at will. The troughs 7, 8, 9, 11, 12, and 13 are each formed with the discharge lip or chute 35, which, as illustrated by dotted lines in Fig. 1, projects over the upper edges of the screens 28 and delivers the pulp directly upon the screens. At that end of the screen-frames 30 opposite to the eyes 33 are formed the eyes 36, which receive the bolts 37, by which the upper ends of the frames 38 for the inclined plates 29 are secured to the vertical straps 39 40, (shown in Fig. 1,) whose purpose will be hereinafter explained. The eyes 36 of the screen-frames 30 are passed between the eyes 41 of the frames 38, and hence the bolts 37, passing through the straps 39 40, serve to connect the frames 30 and 38 together and to said straps. The frame 38 is more clearly illustrated in Figs. 14 and 15, in which it will be seen that said frame conforms substantially in outline with the frame 30 for the screens 28 and is formed with the vertical sides 42 and transverse flange 43, to the latter of which the inclined plate 29 is securely fastened, while the sides 42 constitute, with said plate 29, a shallow trough by

which the pulp which has passed through the screen 28 is directed to the compartment 22 of the troughs 8 9 12 13, inclusive, and to the single compartments of the troughs 10 and 14. The eyes 41 of the frames 38 turn upward and the eyes 36 of the frames 30 turn downward, and hence the adjoining ends of the said frames 30 and 38 may be brought close together and have a pivotal action upon the bolts 37 without interfering with one another and without undue friction. The lower ends of the frames 38 for the inclined plates 29, or those ends which are opposite to the end of said frames 38, having the eyes 41, are supported upon the flanges 44, cast upon the troughs 8, 9, 10, 12, 13, and 14, as illustrated by the dotted lines in Fig. 1, and which flanges are clearly illustrated in Figs. 6, 8, 9, and 11, and thus the lower ends of the frames 38, carrying the inclined plates 29, are supported upon the troughs and may likewise have their inclination adjusted by the adjustment of the troughs. In the arrangement of the screens 28 and inclined plates 29 it will be observed upon reference to Fig. 1 that below each screen 28 there is an inclined plate 29, and that each screen 28 is mounted to receive the wood-pulp from one of the supply-troughs, and that the lower end of each inclined plate 29 is so mounted as to deliver the pulp which has passed through the screen directly to a receiving-trough therefor. It will also be observed upon reference to Fig. 1 that such of the pulp as does not pass through the screen 28 upon which it is delivered will pass over the lower end of said screen and fall upon the next lower screen, through or over which it must pass. Each of the screens 28 has means for its independent supply of the pulp, and each of the inclined plates 29 leads to an independent delivery-compartment, into which the pulp falling upon it will pass. The pipes for supplying the screens with the pulp are independent of one another; but the delivery-pipes for conveying the screened pulp from the machine are substantially connected together and lead to the one delivery-pipe 26.

The bolts 37, which connect the lower ends of the screen-frames 30 with the upper ends of the inclined plate-frames 38 and unite the said ends of the said frames with the straps 39 40, respectively, substantially sustain the weight of the frames 30 38, and said straps 39 40 are suspended from the links 45, which are suspended from the ends of the walking-beams 46. The straps 39 40, bolts 37, links 45, and walking-beams 46 are in duplicate, one set thereof being at each side of the machine, and said walking-beams 46 are, as shown in Fig. 2, connected adjacent to one end with the lower ends of the eccentric-straps 47, suspended from eccentrics on the ends of the transverse shaft 48, located over the machine and receiving the power-wheel 49, by which power may be communicated to the shaft 48 for the purpose of imparting to the eccentric-

straps 47 a vertical reciprocation and to cause said straps to oscillate the walking-beams 46 in order that the latter, through the straps 39 40, may oscillate the screens 28 and plates 29, the object of oscillating the said plates and screens being to facilitate their operation and increase the capacity and operative speed of the machine. The oscillating motion imparted to the screens 28 and plates 29 is limited, but is somewhat quick, and hence the pulp is aided in its discharge through and over the screens 28 and in its discharge over the inclined plates 29. It is intended that the jarring or shaking of the screens 28 and plates 29 shall continue during the entire operation of the machine.

The pulp which is supplied through the pipe 20 to the trough 11 passes upon the upper right-hand screen 28, and that portion of the pulp which then passes through said screen and falls upon the upper right-hand plate 29 is received by the compartment 22 of the trough 12, and through the pipe-sections 24 and branch pipe 25 is conducted to the delivery-pipe 26. That portion of the pulp which does not pass through the upper right-hand screen 28, but moves over the same, requires further treatment, and it falls directly upon the upper left-hand screen 28 and commingles with the pulp supplied thereto by the pipe 19 and trough 7. The pulp which passes through the upper left-hand screen 28 will fall upon the upper left-hand inclined plate 29 and be by the latter conducted to the compartment 22 of the trough 8, from which it will pass through the pipes 24 and branch 27 to the main delivery-pipe 26. The pulp which does not pass through the upper left-hand screen 28, but moves over the same, will fall upon the second right-hand screen 28 and be commingled with the pulp fed thereto from the trough 12 and be acted upon by said screen. The pulp which passes through the second right-hand screen 28 will fall upon the second right-hand inclined plate 29 and be delivered to the receiving-compartment of the trough 13, and thence find its way to the main delivery-pipe 26, while that portion of the pulp which does not pass through the second right-hand screen 28, but moves over the same, will fall upon the second left-hand screen 28 and become mixed with the fresh pulp fed to said screen by the supply-pipe 23 and trough 8. The pulp which passes through the meshes or apertures of the second left-hand screen 28 will fall upon the second left-hand inclined plate 29 and be by the latter conducted to the receiving-compartment 22 of the trough 9 and find its way to the main delivery-pipe 26, while that portion of the pulp which does not pass through but moves over the second left-hand screen 28 will fall upon the third or bottom right-hand screen 28 and become commingled with the pulp fed to said screen through the pipe 23 and trough 13, and that portion of the pulp which passes through the third or bottom right-hand screen will fall

upon the third or bottom right-hand plate 29 and be conducted directly to the trough 14, from which it will escape through the branch pipe 25 to the main delivery-pipe 26. The pulp which moves over instead of through the third or bottom right-hand screen 28 will fall upon the upper end of the third or bottom left-hand screen 28 and mix with the pulp being fed to the said screen from the supply-pipe 23 and trough 9, and the pulp which passes through this third or bottom left-hand screen 28 will fall upon the third or bottom left-hand plate 29 and be by it conducted directly to the trough 10, from which it will pass to the branch pipe 27 and thence to the main delivery-pipe 26. The pulp which does not pass through the third or bottom left-hand screen 28, but moves over said screen, will fall into the receptacle 4, from which it may be removed through the pipe 6 or in any other convenient way. It will be observed that each of the screens 28 below the top screen in addition to receiving the fresh pulp for separation also receives the pulp which has passed over instead of through the screens above it, and hence all of the screens are in active simultaneous use in the screening of the fresh pulp, and in addition thereto all of the screens below the top screen are acting upon the pulp which has passed over instead of through the screens above them.

In the machine shown in the accompanying drawings three inclined screens 28 and three inclined plates 29 extend inward from the opposite ends or sides of the machine; but the invention is not limited to the use of any special number of the screens and plates extending inward from the end or side of the machine, and the number of these screens and plates will be increased or diminished in accordance with the capacity of machine desired and the will of the manufacturer or user of the machines.

Without limiting the invention to details of form or construction other than expressly indicated in the claims, what I claim as new, and desire to secure by Letters Patent, is—

1. In a machine for screening pulp, the series of inclined screens whose mesh is adapted for the screening of pulp, and means for delivering the pulp flushed with water to the upper end of each of said screens, combined with the series of inclined plates (one being below each screen and inclined oppositely thereto), and a receiving-trough at the lower end of each of said plates to receive the pulp and water which falls upon said plates by passing through the respective screens above the same, the relation of said screens being such that the pulp which moves over instead of through a screen will pass upon a lower screen to be acted upon by it and mix with the pulp and water directly fed thereto; substantially as set forth.

2. In a machine for screening pulp, the series of inclined screens whose mesh is adapted for the screening of pulp, means hinging

said screens at their upper ends, and troughs to receive and deliver the pulp flushed with water to the upper end of each of said screens, combined with the series of inclined plates, one being hinged to the lower end of each screen and inclining oppositely thereto, means freely supporting the lower end of said inclined plates to permit the limited sliding action of said plates when actuated by the movement of said screens, means for rocking said screens on their hinge-supports, and a receiving-trough at the lower end of each of said plates to receive the pulp and water which falls upon said plates by passing through the respective screens above the same, the relation of said screens being such that the pulp which moves over instead of through a screen will pass upon a lower screen to be acted upon by it and mix with the pulp fed thereto; substantially as set forth.

3. In a machine for screening pulp, the series of inclined screens whose mesh is adapted for the screening of pulp, the troughs to receive and deliver the pulp flushed with water to the upper ends of said screens, means for the vertical adjustment of said troughs, and means connecting the upper ends of said screens with said troughs, combined with the series of inclined plates (one being below each screen and inclined oppositely thereto), and a receiving-trough at the lower end of each of said plates to receive the pulp and water which falls upon said plates by passing through the respective screens above the same, the relation of said screens being such that the pulp which moves over instead of through a screen will pass upon a lower screen to be acted upon by it and mix with the pulp and water fed thereto; substantially as set forth.

4. In a machine for screening pulp, the series of inclined screens whose mesh is adapted for the screening of pulp, and the troughs to receive the pulp flushed with water and deliver the same to the upper ends of said screens, combined with the series of inclined plates, one being below each screen and inclined oppositely thereto, the receiving-trough at the lower end of each of said plates to receive the pulp and water which falls upon said plates by passing through the respective screens above the same, delivery-pipes connecting said receiving-troughs with one another and leading to a discharge, and the lower receptacle having a discharge-outlet and adapted to receive the pulp which has passed over said screens and requires further treatment, the relation of said screens being such that the pulp which moves over instead of through a screen will pass upon a lower screen to be acted upon by it and mix with the pulp and water fed thereto, substantially as set forth.

5. In a machine for screening pulp, the feed-trough for supplying the pulp flushed with water, the inclined screen extending downward and inward from said trough, and means hinging said screen at its upper end, com-

5 bined with the inclined delivery-plate extending downward and outward below said screen and hinged at its upper end to the lower end of said screen, a support for freely receiving the lower end of said plate to permit the movement of the latter when actuated during the shaking of said screen, and means applied to the converging ends of said screen and plate for supporting and rocking or shaking 10 the same; substantially as set forth.

15 6. In a machine for screening pulp, the series of inclined screens extending inward and downward below one another from opposite sides of the machine, the troughs for supplying said screens with the pulp, and the series of inclined plates extending downward and outward to the opposite sides of said machine from the lower ends of said screens for delivering the pulp which has passed through the 20 screens, combined with the straps 39, 40, secured to said screens and plates at their converging ends, the walking-beams connecting the upper ends of said straps, the eccentric-straps connected to said walking-beams, the 25 eccentrics engaging said eccentric-straps, and the power-shaft carrying said eccentrics; substantially as set forth.

30 7. In a machine for screening pulp, the supply-trough 7, the inclined screen extending downward and inward therefrom, and the

inclined plate extending downward and outward from the lower end of said screen, combined with the trough 8 having the compartments 21, 22 and receiving in the compartment 22 the screened pulp from said plate, 35 the inclined screen extending downward and inward from said compartment 21, the inclined plate extending below said last-mentioned screen to receive the pulp which passes through the same, and a receptacle to receive 40 the pulp which passes over instead of through said screens; substantially as set forth.

8. In a machine for screening pulp, the series of oppositely-inclined screens, and the corresponding series of inclined plates, combined with the independently-adjustable 45 troughs for supplying the pulp to said screens, the upper and lower troughs having the single compartment and the intermediate troughs having the two compartments, one of which 50 is to supply the pulp to be screened and the other to receive the screened pulp; substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 7th day of 55 October, A. D. 1898.

CHARLES SMITH.

Witnesses:

CHAS. C. GILL,
E. JOS. BELKNAP.