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PATENTED AUG. 9, 1904.

D. C. DENISON.
PAPER PERFORATING MACHINE.

APPLICATION FILED OCT. 1, 1901. RENEWED JAN. 22, 1904.

NO MODEL.

3 SHEETS—SHEET 1.

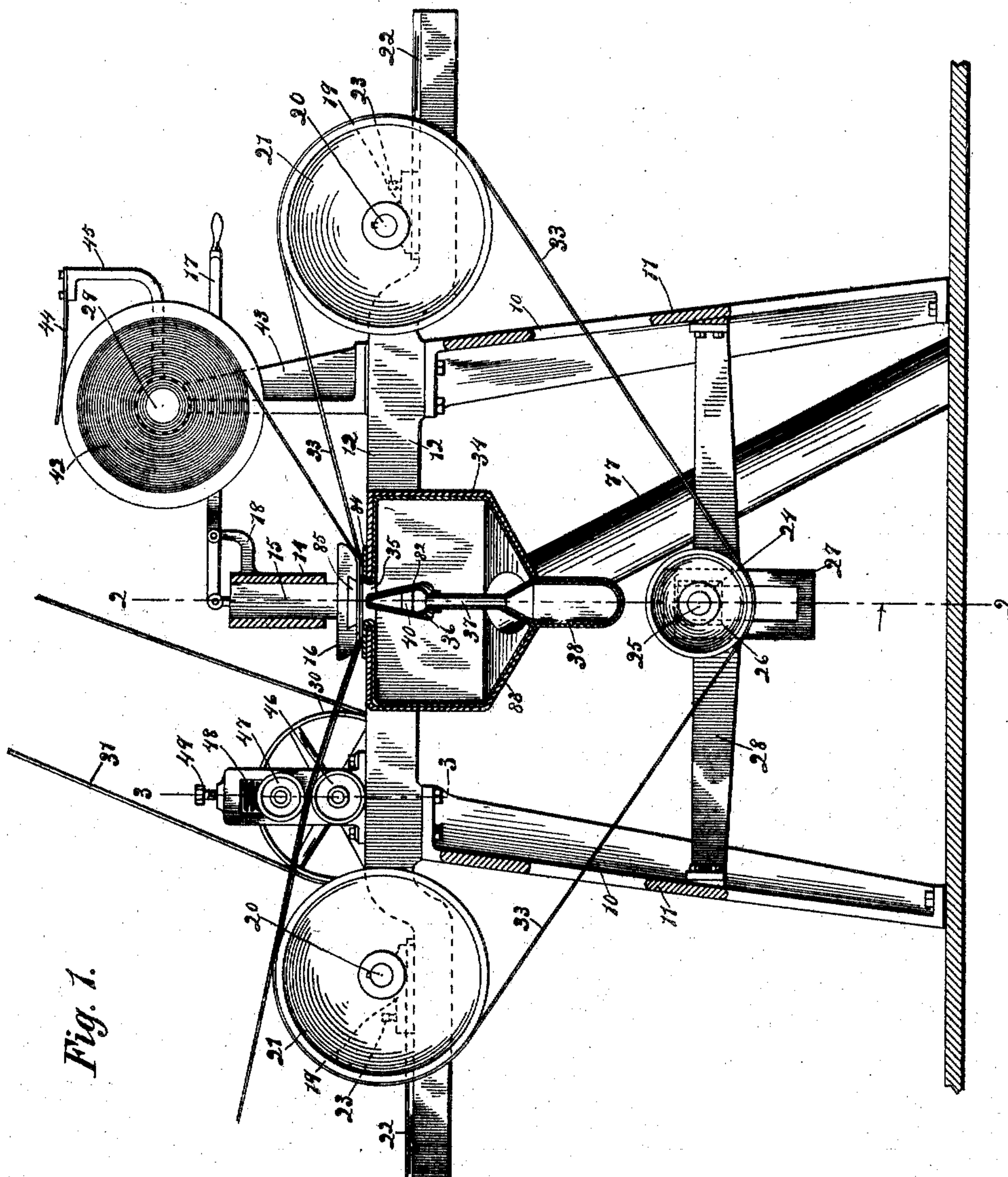


Fig. 1.

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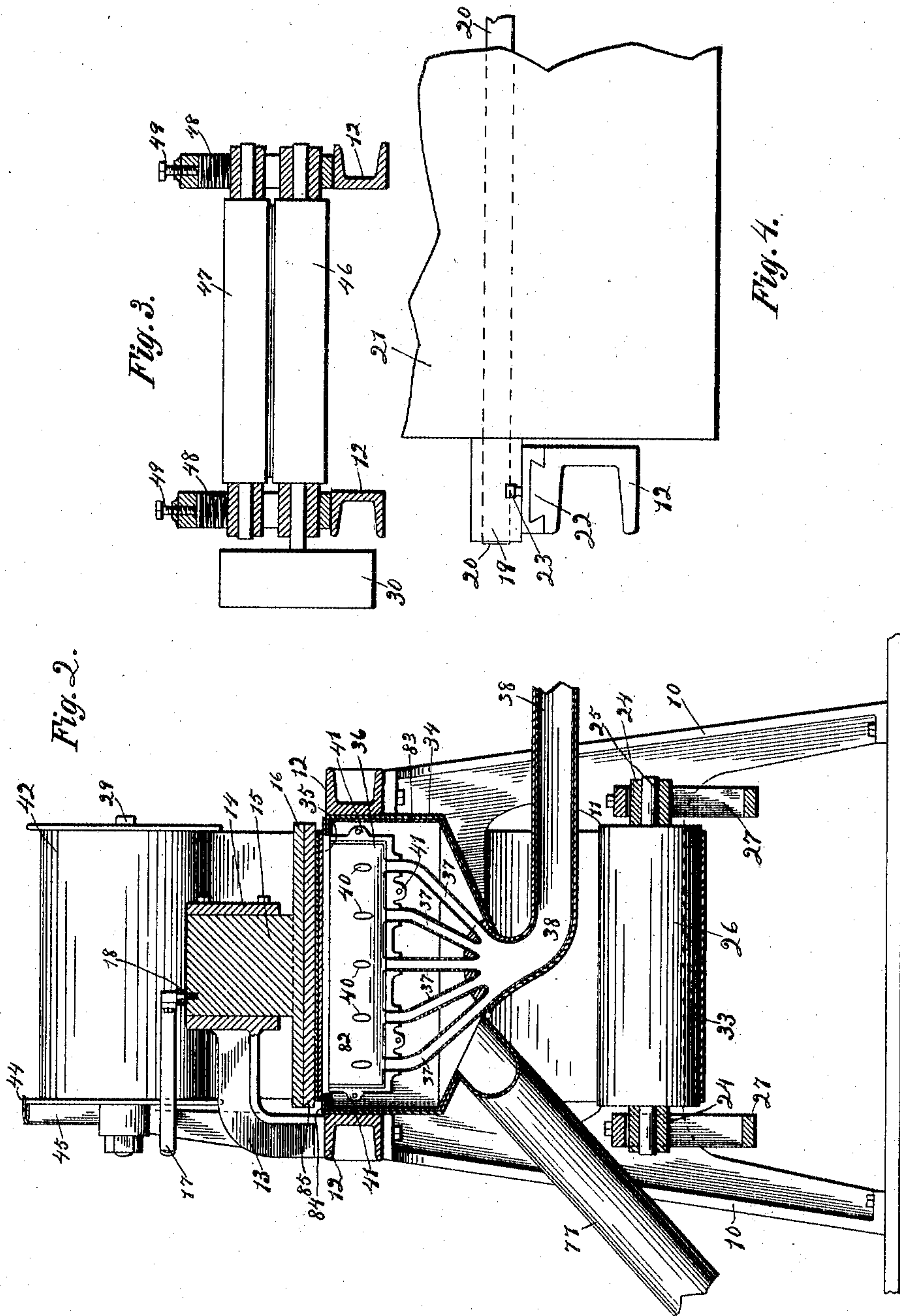
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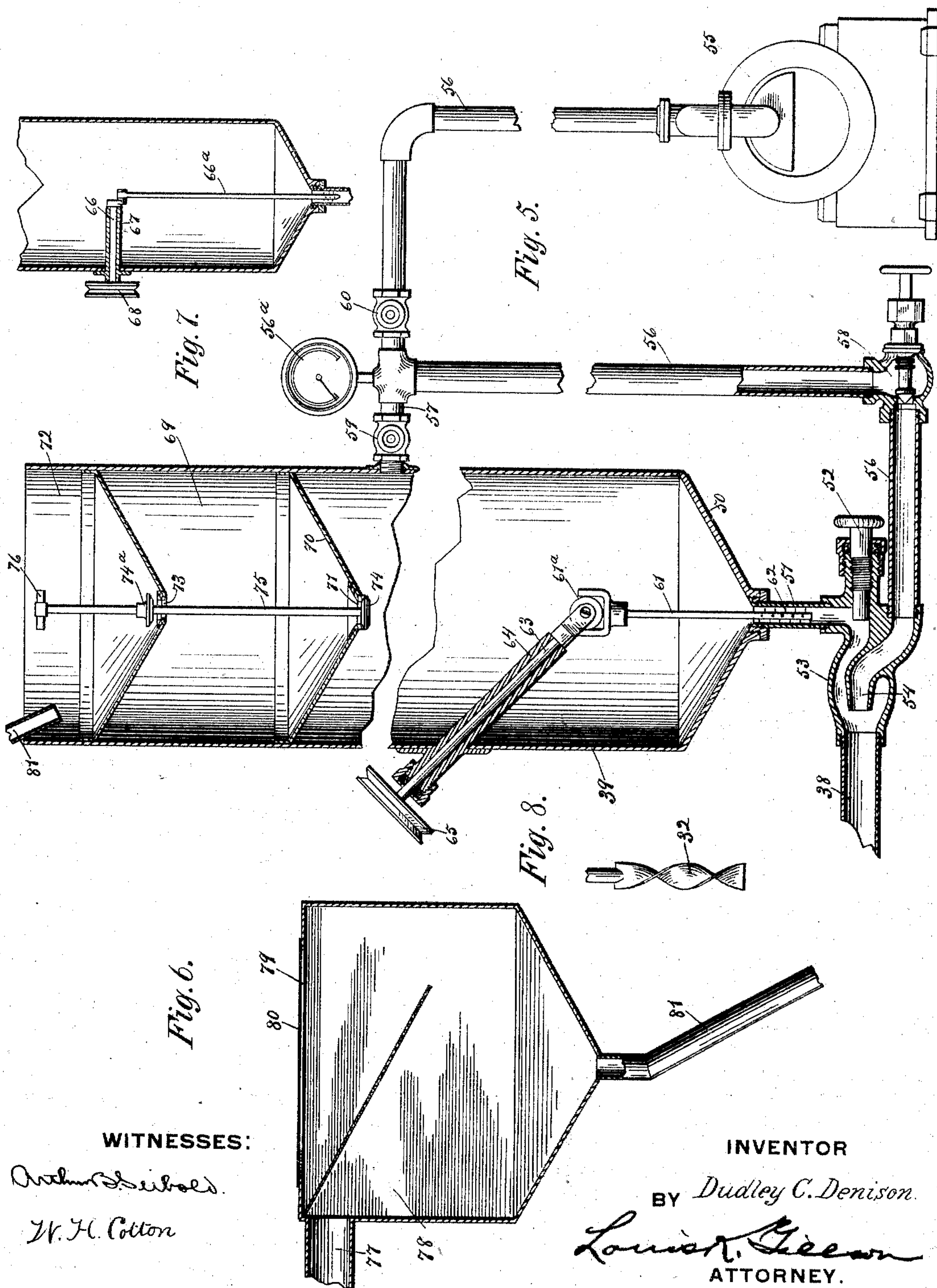
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PAPER-PERFORATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 767,104, dated August 9, 1904.

Application filed October 1, 1901. Renewed January 22, 1904. Serial No. 190,239. (No model.)

To all whom it may concern:

Be it known that I, DUDLEY C. DENISON, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Paper-Perforating Machines, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

This invention relates to an apparatus for perforating paper or similar material, such as the webs or disks employed with self-playing musical instruments, toilet-paper, sheets of stamps, automatic telegraph-ribbons, &c.

The object of the invention is to generally improve and perfect the machines or apparatus now employed for the above purposes and to provide an apparatus of comparatively simple construction and of great efficiency for accomplishing the desired results.

To this end the invention consists in the construction, combination, and arrangement of parts, as will be hereinafter more fully described, and particularly pointed out in the claims, and as illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of the apparatus, some of the parts being shown in full lines. Fig. 2 is a section on the line 2 2 of Fig. 1 looking in the direction of the arrow. Fig. 3 is a section on the line 3 3 of Fig. 2. Fig. 4 is a detail illustrating the means for adjusting the rollers carrying the pattern web or belt. Fig. 5 is a view, partly in vertical section, of the sand-receptacle, showing its connection with the air-compressor. Fig. 6 is a detail of the air and sand separator. Fig. 7 is a modification of the agitator illustrated in Fig. 5, and Fig. 8 shows a screw which may be substituted for the agitator seen in Figs. 5 and 7 for feeding the sand from the tank.

Referring to Figs. 1 and 2, 10 indicates a table-like support or frame, the legs of which are connected by suitable cross-pieces 11 and have bolted to the tops thereof side rails or bars 12. Secured to one of the side rails or bars 12 is an arm 13, which overhangs the supporting-frame 10 and is provided at its free end with a vertical guide 14, in which recip-

rocates a slide 15, having secured to its lower end a shoe 16. A lever 17, pivoted to the top of the slide 15, is fulcrumed on a bracket 18 and is designed to raise the shoe 16.

Journaled in bearings 19 at each end of the machine is a shaft 20, to which is keyed a roller 21, and the bearings 19 are provided with dovetailed recesses and slide on the guides 22 of the extended ends of the side rails or bars 12, set-screws, as 23, being provided for holding the bearings against movement. Also journaled in movable bearings, as 24, is a shaft 25, which has keyed to it an idler or pulley 26. The bearings 24 slide in vertical guides 27, formed in the cross-bars 28 connecting the legs of the supporting-frame 10 and which also serve to give rigidity to the said frame.

Traveling over and around the rollers 21 and under the shoe 16 is an endless belt 33. This belt is designed to be provided with the musical notes or melody or other pattern or design to be imparted, by means of a perforating sand-blast, to the sheet or web being operated upon, and such pattern-belt is preferably made of rubber, although any other material capable of resisting the injurious effects of a sand-blast under great pressure may be substituted. The movable bearings 19 permit of a considerable adjustment of the rollers 21 in order to adapt the apparatus to pattern belts or webs of various lengths when employed for perforating music webs or rolls, and the pulley 26, the bearings of which are freely movable, is of sufficient weight to maintain the proper degree of tautness in the pattern-belt.

Located below the shoe 16 and secured between the side rails 12 is a box or casing 34. This casing is provided with an elongated mouth 35 in the side adjacent to the shoe 16, which mouth is preferably of about the same length as the said shoe, and located within and having its mouth projecting into or through the mouth 35 of the casing 34 and toward the shoe 16 is a nozzle 36. This nozzle is substantially triangular in cross-section, the mouth of the same being through the apex of the triangle, and the base or bottom is curved, as shown, in order to avoid corners or angles in which sand might lodge.

Entering the base of the nozzle 36 are a plurality of tubes or pipes 37, suitably spaced apart, which communicate with an enlarged supply-pipe 38, secured to the bottom of the casing 34 and which leads from the sand tank or receptacle 39. The nozzle 36 is located transversely of the frame 10, as is also the shoe 16, being designed to project a sand-blast against the pattern-belt 33 and a web of paper passing between the same and the shoe 16 and is made of a width at least equal to the width of the pattern of said belt.

Located in the nozzle 36 and over the mouth of each of the tubes or pipes 37 is a deflector 40, which serves to deflect and divide the sand-blast entering through its companion pipe 37 and project the particles of sand at an angle against the exposed portions through the pattern-web of the material being operated upon, thereby greatly facilitating the cutting out or perforating of the same. Preferably the nozzle 36 is cast in two sections, a half of each of the deflecting-pieces being formed on each thereof, and the two sections are bolted together through ears 41. The best results are secured by making the deflectors 40 elliptical in cross-section and of slight thickness in order that they may only deflect the particles of sand and not obstruct the passage of the blast.

The arbor 29, on which the roll or web, as 42, to be perforated is wound, is journaled in a support 43, secured to the frame 10, any suitable means, such as a spring 44, bearing against the roll-holder and carried by an arm 45, being provided for retarding the unwinding movement of the roll. The paper is led under the shoe 16 and between feed-rollers 46 47, which are held in close relation to the web of paper and the pattern-belt, which also passes between the said rollers, by springs 48, the tension of which is adjusted by bolts 49, and the perforated material is again formed into a roll by means of any suitable winding mechanism. (Not shown.) Movement is imparted to the rollers 46 47 for simultaneously feeding the paper and the pattern web or belt 33 through the medium of a pulley 30, driven by a belt 31 in the usual manner.

The sand tank or receptacle employed with the apparatus is shown in Fig. 5. This tank 39 is provided with a tapering bottom 50, from which leads a pipe 51, the outlet whereof is closed by a screw-valve 52. The pipe 51 discharges into a bulb or globe 53, into which projects an injector-nozzle 54. Leading from the air-compressor (conventionally shown at 55) to the injector-nozzle is a pipe or duct 56, and a connection 57 enters the tank 39 near the upper end thereof, supplying air to assist in forcing the sand into the blast-pipe and to prevent the formation of a vacuum in the tank. The pipe 56 is provided with a screw-valve 58, as is also the connection 57, as 59, and a similar valve 60 is located in the pipe

56 between the valves 58 59 and the compressor. The valve 52 is designed to shut off or regulate the feed of sand to the injector-globe 53, and the valves 58 and 59 regulate the supply of air to the injector-nozzle and into the tank, while the valve 60 is employed for controlling the pressure from the compressor. The pipe 56 may be provided with a pressure-gage 56^a beyond the valve 60, if desired.

In order to feed the sand through and prevent it clogging in the outlet-pipe 51, I have provided an agitating device which may consist of a vertical shaft 61, projecting through the bottom of the tank 39 and into the pipe 51 and provided with a number of fingers or teeth 62. The shaft 61 is connected, by means of a universal coupling 61^a, to an inclined shaft 63, journaled in a sleeve 64, projecting into the tank 39 and provided with a pulley 65, which may be driven in any convenient manner. A modification of this agitating device is illustrated Fig. 7. As shown, the rod 66^a is reciprocated by a crank-shaft 66, journaled in a sleeve 67 and provided with a driving-pulley 68, or the sand may be fed by means of a worm 32, Fig. 8, driven by the mechanism illustrated in Fig. 5 for operating the agitator-shaft 61.

In order to return the sand from the casing 34 to the tank 39, the following means may be employed: The tank may be provided with an upper chamber 69, the bottom 70 of which has a port 71 opening into the tank. The top of the chamber 69 forms a hopper or basin 72, having a port 73 entering the said chamber, and tapers downwardly, as does also the bottom 70 or partition, between the chamber 69 and the tank 39. The ports 71 and 73 are closed by valves 74 74^a, carried by a stem 75 and differentially spaced from the said ports, the valve 74 for closing the port 71 being located below the said port, while the valve 74^a for closing the port 73 is located above the same. A handle 76 is provided for moving the valve-stem 75. When the stem 75 is raised to open the valve 74^a to permit the sand in the hopper 72 to fall into the chamber 69, the port 71 will be closed by the valve 74. As soon as the stem 75 is released the air-pressure in the tank 39 against the valve 74 will immediately seat the same, thereby opening the valve 74^a again. This alternate opening of the valves prevents the passage of a current of air from the tank 39 through the chamber 69, thereby wasting the same and which would prevent the returning of the sand through the said chamber 69 to the tank. The sand after being projected by the blast against the pattern web or belt 33 is immediately carried by the current of air against the bottom of the casing 34 and then by way of the pipe 77, leading from the said casing, back to the chamber 78. This chamber is provided with an opening 79, closed by a screen 80, through which the air exhausts to the atmosphere, the sand

falling to the bottom of the chamber 78 and then passing through a tube 81 into the hopper or basin 72, located at the top of the tank 39, and finally finds its way into the said tank, 5 when the valves 74 and 74^a are manipulated as heretofore described.

In order to protect from injury the parts of the machine or apparatus against which the sand-blast is projected, the inner walls of the 10 nozzle 36 and the deflectors 40 are provided with a coating of soft rubber or other suitable material, as 82, and the interior of the casing 34 also has a similar lining 83. A rubber gasket 84, which may be integral with the lining of the casing 34, is provided for the protection of the mouth of the latter, and extending 15 around the edges of the said mouth it also serves to secure, when the shoe 16 by its weight presses the material being operated upon and the pattern web or belt 33 against the said 20 gasket, an air-tight joint, thereby preventing the escape to the atmosphere of the sand and air projected from the nozzle 36 and compelling the return of the same to the casing, so as to be carried back through the pipe 77 to 25 the sand-tank.

It is necessary that the paper or other material being operated upon be held against a firm and unyielding surface, and inasmuch as 30 the face of the shoe if of a permanent character would soon become pitted and roughened owing to the cutting action of the sand-blast, and thereby rendered ineffective in consequence of the air-cushion which would form 35 between the material and the shoe, the latter is designed to be provided with a removable wearing-face. To this end the shoe is formed with a dovetailed recess into which slides a wearing-plate 85, which may be removed and 40 a new one inserted as occasion requires.

In the foregoing description I have spoken of sand as the material used with the machine; but it will be obvious that any other material, such as emery-dust, may also be employed 45 for securing the same results.

While I show and describe herein the pattern-carrying drums as being journaled on overhanging arbors and such arbors as being carried by adjustable slides or blocks, I do 50 not claim these features as a part of my invention.

I claim as my invention—

1. In an apparatus for perforating paper and other material, in combination, a pattern 55 web or belt adapted to carry the material to be operated upon, pulleys over which the pattern web or belt travels, a flat-faced shoe for yieldingly pressing and holding the web or sheet of paper, or other material, against the 60 pattern-belt, and means for projecting a sand-blast toward the shoe and against the pattern web or belt.

2. In an apparatus for perforating paper and other material, in combination, a pattern 65 web or belt adapted to carry the material to

be operated upon, a flat-faced shoe for yieldingly pressing and holding the material to be operated upon against the pattern web or belt, and means for projecting a sand-blast toward the shoe and against the pattern web or belt. 70

3. In an apparatus for perforating paper and other material, in combination, a pattern web or belt adapted to carry the material to be operated upon, pulleys over which the pattern web or belt travels, a slide, a guide in 75 which the slide moves, a flat-faced shoe rigidly fixed to the slide and yieldingly pressing and holding the material to be operated upon against the pattern web or belt, and means for projecting a sand-blast toward the shoe 80 and against the pattern web or belt. 8c

4. In an apparatus for perforating paper and other material, in combination, a pattern web or belt, means for holding the paper or other material against the pattern web or belt, 85 means for feeding the paper with the pattern web or belt, and a nozzle for projecting a sand-blast against the pattern web or belt, the said nozzle being provided with a bar located therein transversely to the mouth of the nozzle for 90 deflecting the blast passing therethrough.

5. In an apparatus for perforating paper and other material, in combination, a pattern web or belt, means for holding the paper or other material against the pattern web or belt, 95 means for feeding the paper with the pattern web or belt, a nozzle having an elongated outlet directed toward the holding means and arranged in a line parallel with the outlet of the nozzle, a plurality of tubes entering the 100 nozzle, and means for supplying an air-blast to the nozzle.

6. In an apparatus for perforating paper and other material, in combination, a pattern web or belt, a casing having a mouth, a shoe 105 between which and the pattern web or belt the material to be operated upon is interposed and which yieldingly presses and holds the pattern web or belt against the casing and over the mouth thereof, means for feeding the material to be operated on with the pattern web or 110 belt, and a nozzle for projecting a sand-blast against the said pattern.

7. In an apparatus for perforating paper and other material, in combination, a pattern 115 web or belt, pulleys over which the belt travels, a casing having a mouth, a shoe between which and the pattern web or belt the material to be operated upon is interposed and which shoe yieldingly presses and holds the 120 pattern web or belt against the casing and over the mouth thereof, a yielding strip surrounding the mouth of the casing and interposed between the casing and the pattern web or belt, a nozzle for projecting a sand-blast 125 through the mouth of the casing and against the pattern web or belt, and means for feeding the material to be operated upon with the pattern web or belt.

8. In an apparatus for perforating paper 130

and other material, in combination, a pattern web or belt, a casing having an outlet, an adjustable flat-faced shoe for yieldingly holding the pattern web or belt against the casing and over the outlet thereof, a nozzle located in the casing and projecting a sand-blast through the opening of the casing and against the pattern web or belt, a sand-tank, a pipe leading from the tank to the nozzle, means for feeding sand to the pipe, an air-compressor for forcing the sand through the nozzle in the casing, and means for feeding the pattern web or belt with the material to be operated upon.

9. In an apparatus for perforating paper and other material, in combination, a pattern web or belt, a casing having an outlet, a yielding flat-faced shoe for holding the pattern web or belt against the casing and over the outlet thereof, a nozzle located in and pointing through the outlet of the casing, a sand-tank, a pipe leading from the tank to the nozzle, an agitator located in said pipe, an air-compressor for forcing the sand through the nozzle in the casing, and means for feeding the pattern web or belt with the material to be operated upon.

10. In an apparatus for perforating paper and other material, in combination, a pattern web or belt, a casing having an outlet, a shoe for holding the pattern web or belt against the casing over the outlet thereof, a nozzle located in and projecting a sand-blast through the outlet of the casing, a sand-tank, a pipe leading from the tank to the nozzle, a valve in said pipe, an injector-nozzle entering said pipe, an agitator revolving in the said pipe, an air-compressor, a connection between the air-compressor and the injector-nozzle, means for feeding the pattern web or belt with the paper, and means for returning the sand of the blast from the casing to the sand-tank.

11. In an apparatus for perforating paper and other material, in combination, a pattern web or belt adapted to carry the material to be operated upon, a nozzle for projecting a sand-blast against the pattern web or belt, a sand-tank, a pipe leading from the sand-tank to the nozzle, an injector-nozzle entering the pipe leading from the sand-tank, means for supplying an air-blast to the injector-nozzle, a duct leading from the casing back to the sand-tank, and an air-vent in such duct.

12. In an apparatus for perforating paper and other material, in combination, a pattern web or belt, a casing having an outlet, a shoe

for holding the pattern web or belt against the casing and over the outlet thereof, a nozzle located in and directed toward the outlet of the casing, a sand-tank, a pipe leading from the tank to the nozzle, an injector-nozzle entering said pipe, an air-compressor, connection between the injector-nozzle and the compressor, a chamber located above the sand-tank and having an inlet and an outlet, the latter leading to the sand-tank, valves for alternately opening and closing the said outlet and inlet, a connection between the casing and such chamber, and an air and sand separator located in such connection.

13. In a sand-blast machine, in combination, a source of air-pressure, a receiving-chamber having a mouth, means for pressing material to be operated upon against the mouth, a nozzle within the chamber and directed toward the mouth, a duct leading from the source of pressure to the nozzle, a sand-tank communicating with the duct, a duct leading from the receiving-chamber to the sand-tank, and an air-vent at the tank end of such duct.

14. In a sand-blast machine, in combination, a blast-nozzle, a sand-tank, an air-compressor, a duct leading from the compressor to the nozzle, a branch air-duct leading to the sand-tank, connection between the sand-tank and the first-named duct, and an injector-nozzle in such duct at said connection.

15. In a sand-blast machine, in combination, a casing having a mouth, a pressure-shoe over the mouth, a perforated work-carrying shield interposed between the shoe and the walls of the mouth and forming a substantially airtight packing, and a nozzle within the casing directed toward the mouth.

16. In an apparatus for perforating paper and other material, in combination, a pattern web or belt, means for holding the paper or other material against the pattern web or belt, means for feeding the paper with the pattern web or belt, a nozzle having an elongated outlet directed toward the holding means, a plurality of tubes entering the nozzle, means for supplying an air-blast to the tubes, and a transverse deflecting-bar in the nozzle and in the path of the air entering through each of the tubes.

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