No. 896,427. PATENTED AUG. 18, 1908.

F. E. ABBOTT.

BRIQUET MAKING MACHINE.

APPLICATION FILED SEPT. 2, 1905.

5 SHEETS—SHEET 1.

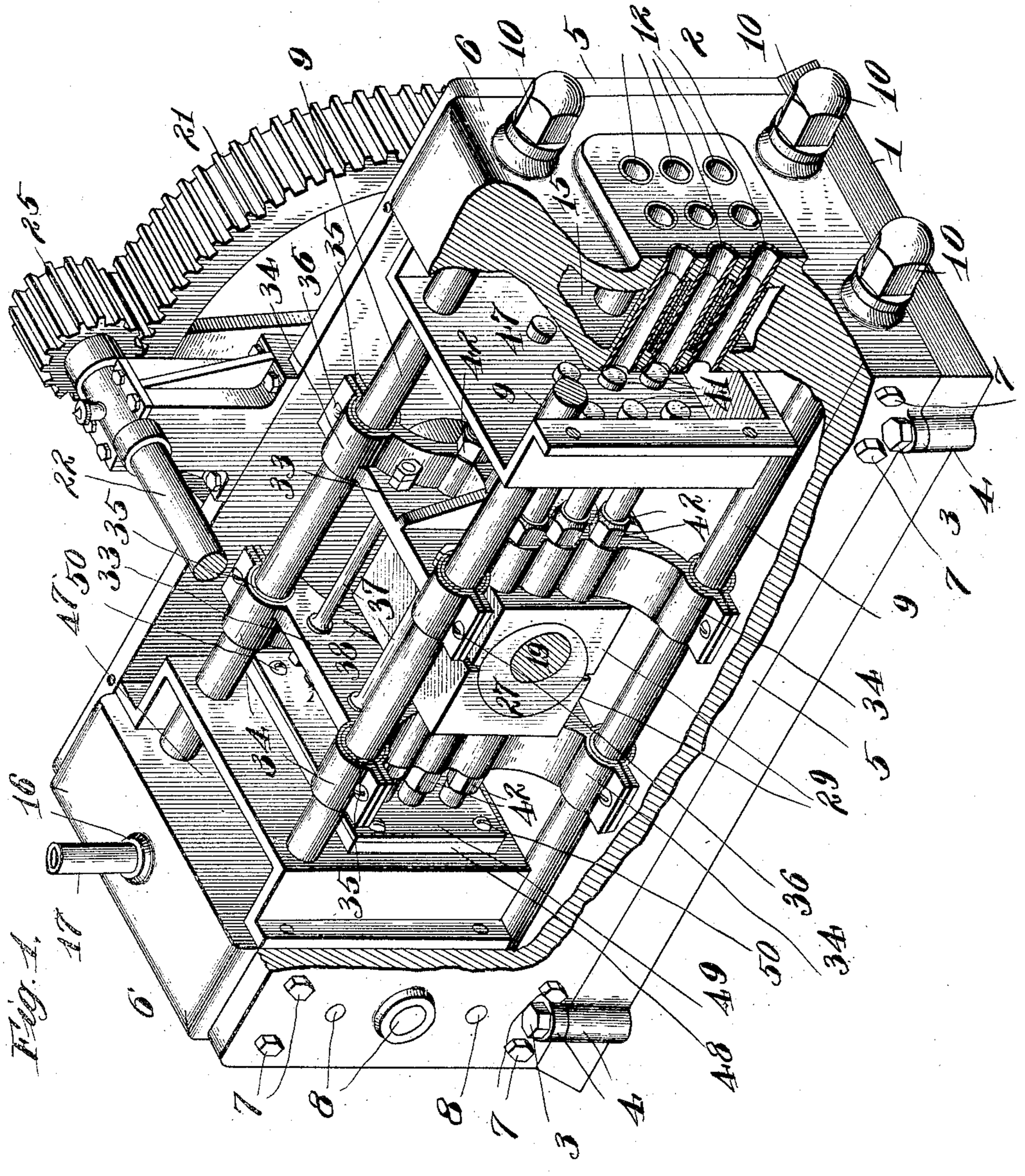

Fig. 1.

Witnesses:

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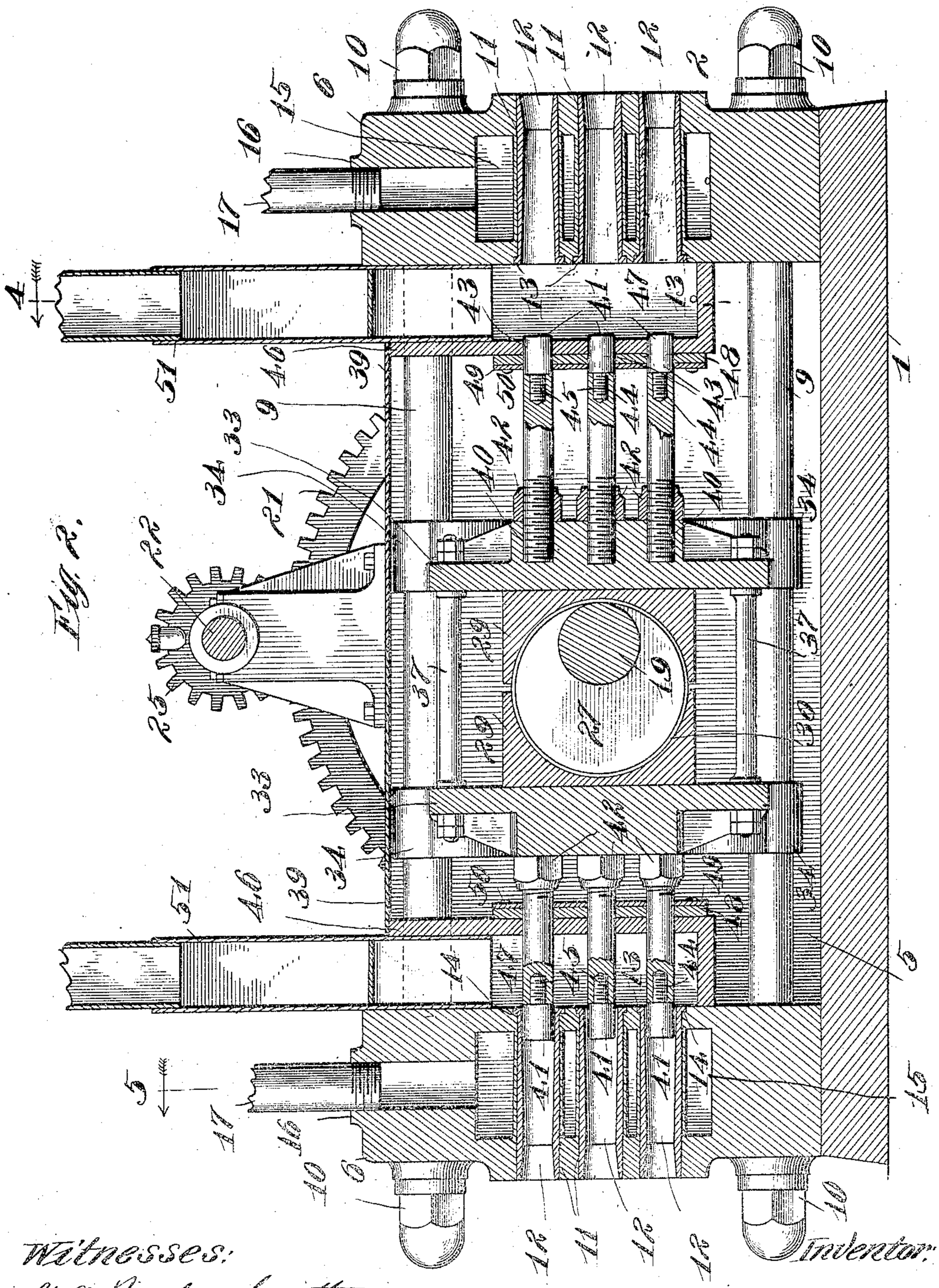
5 SHEETS—SHEET 2.

Fig. 2.



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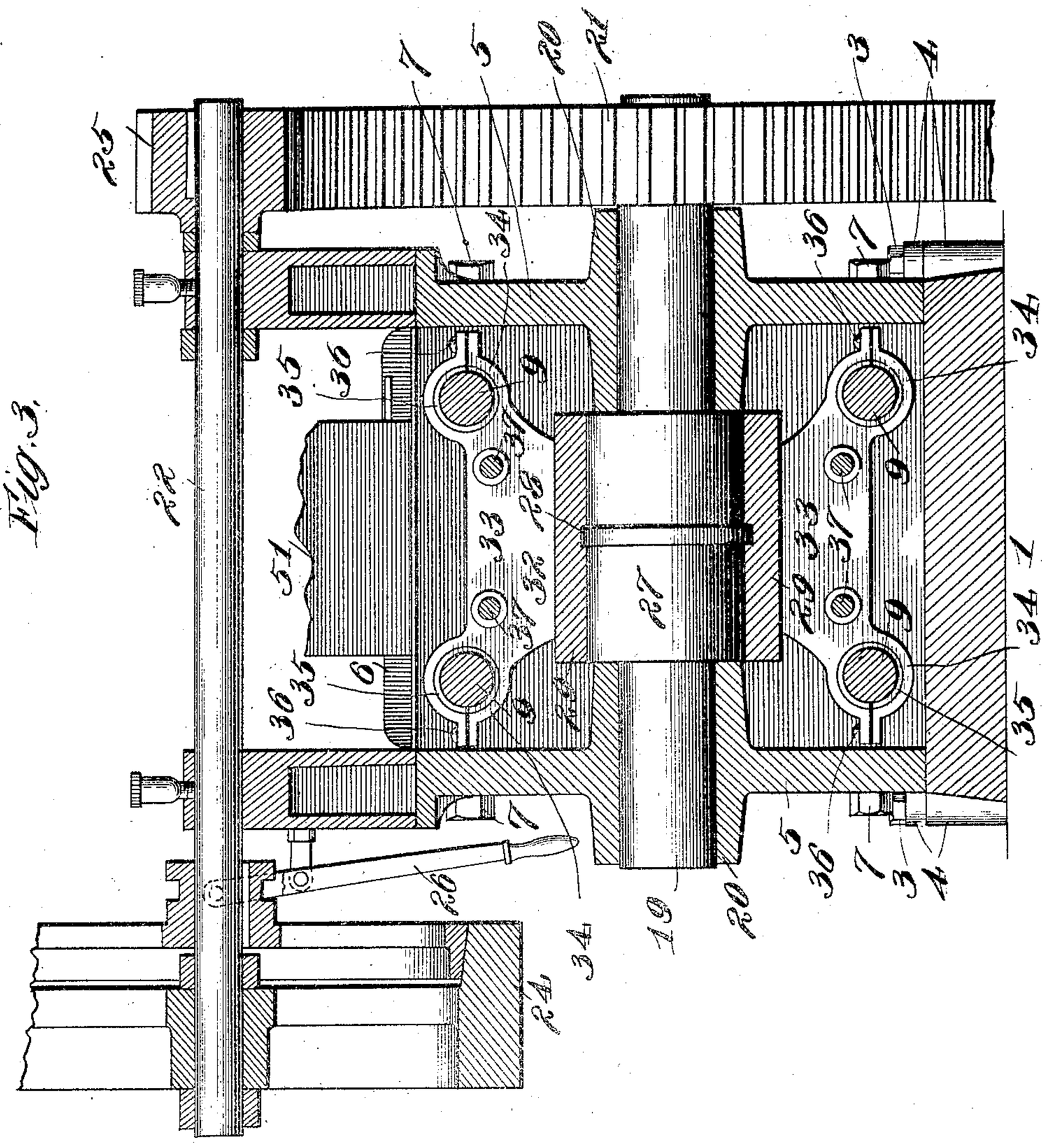
5 SHEETS—SHEET 3.

Fig. 3.



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5 SHEETS—SHEET 4.

Fig. 3.

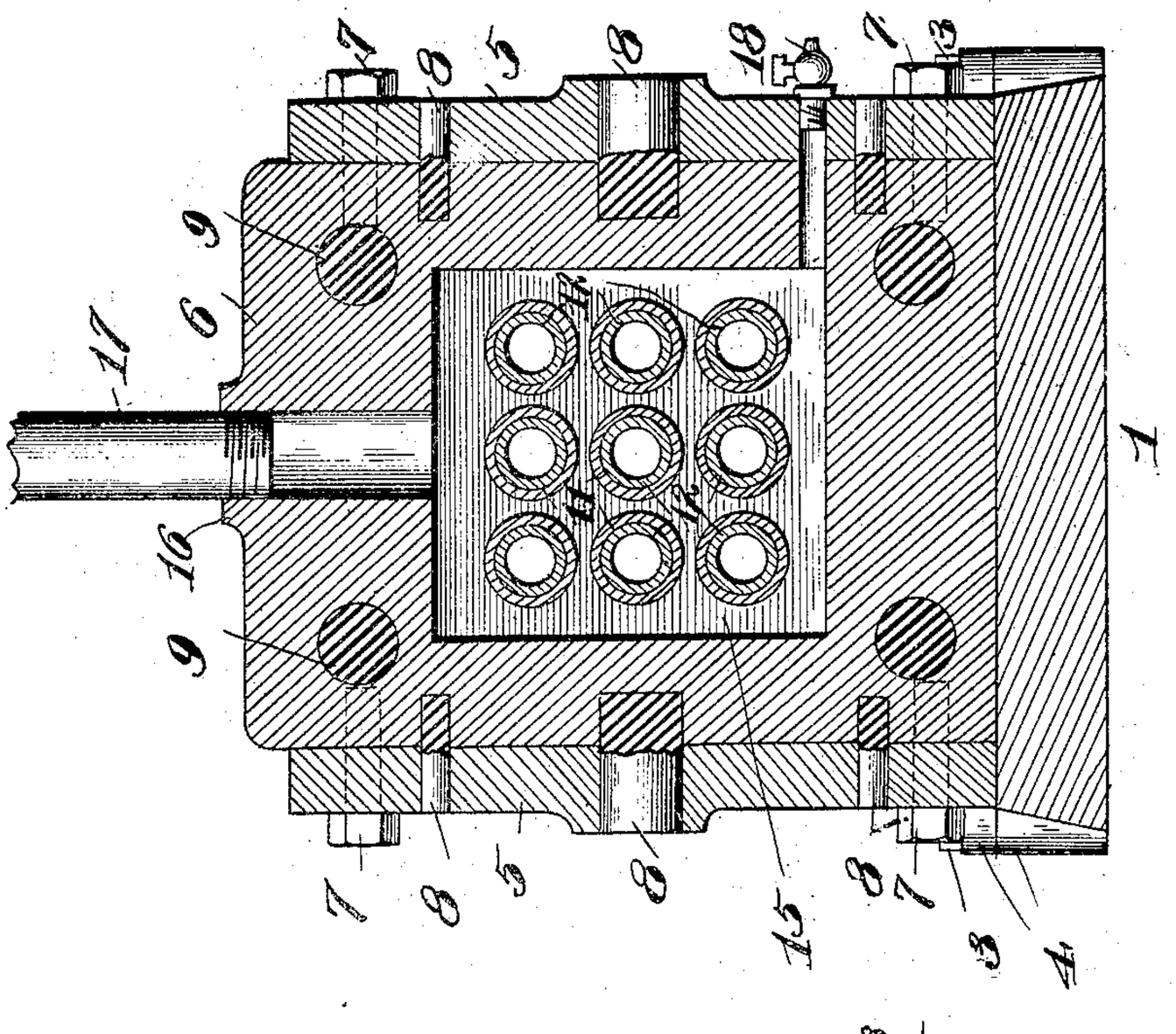
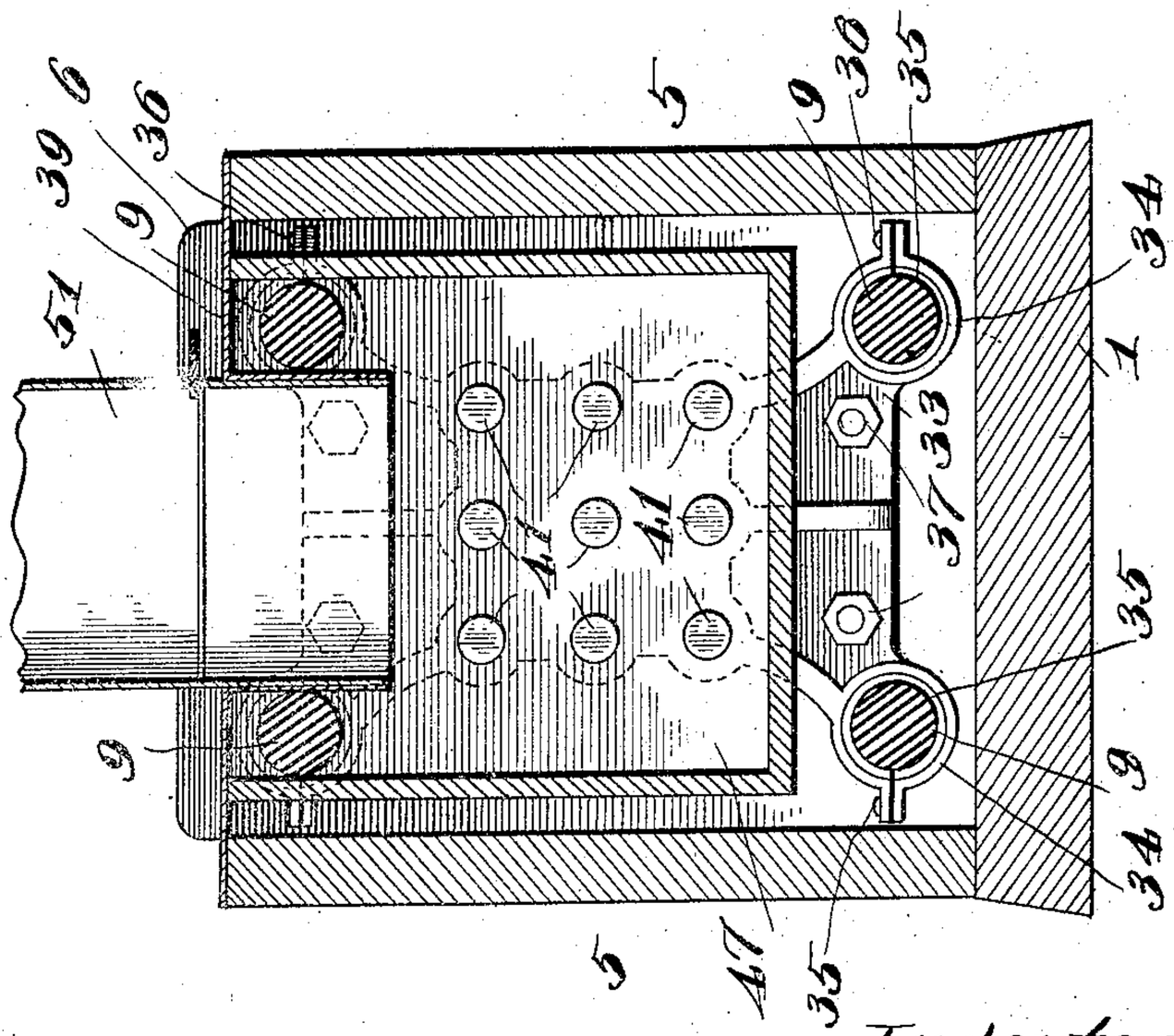


Fig. 4.



Witnesses:
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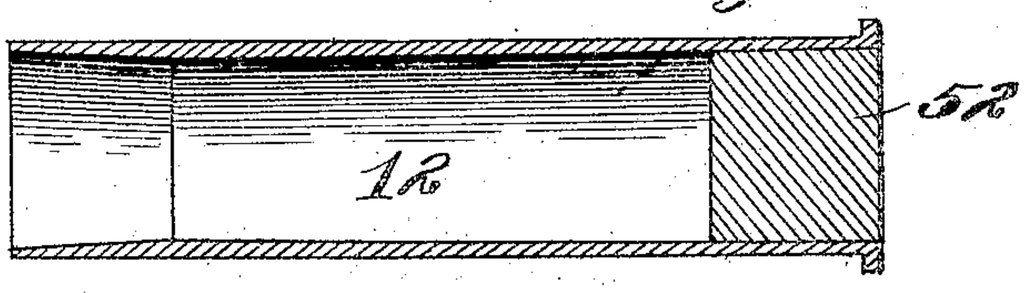
5 SHEETS—SHEET 5.

Fig. 6.



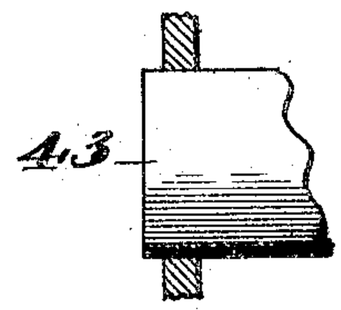


Fig. 7.

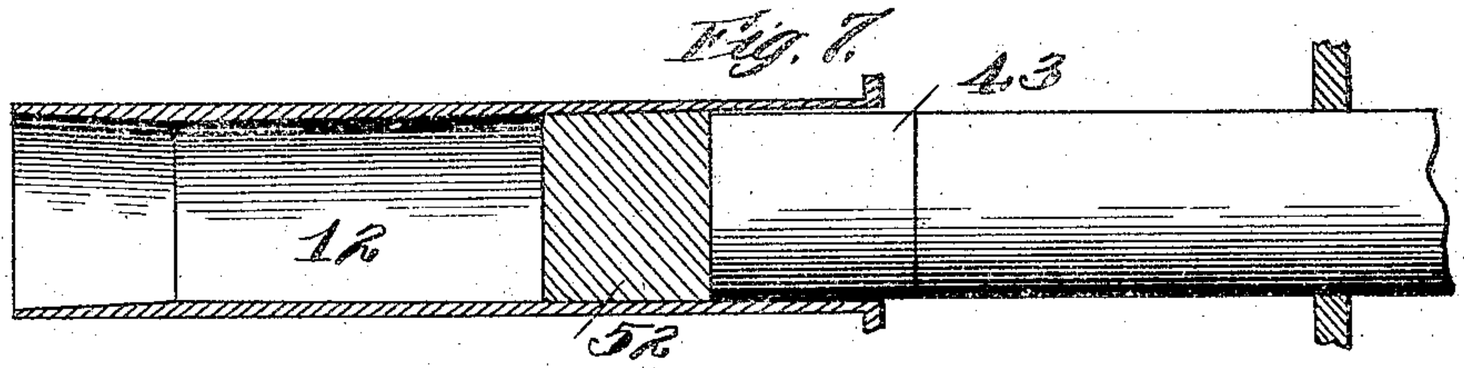


Fig. 8.

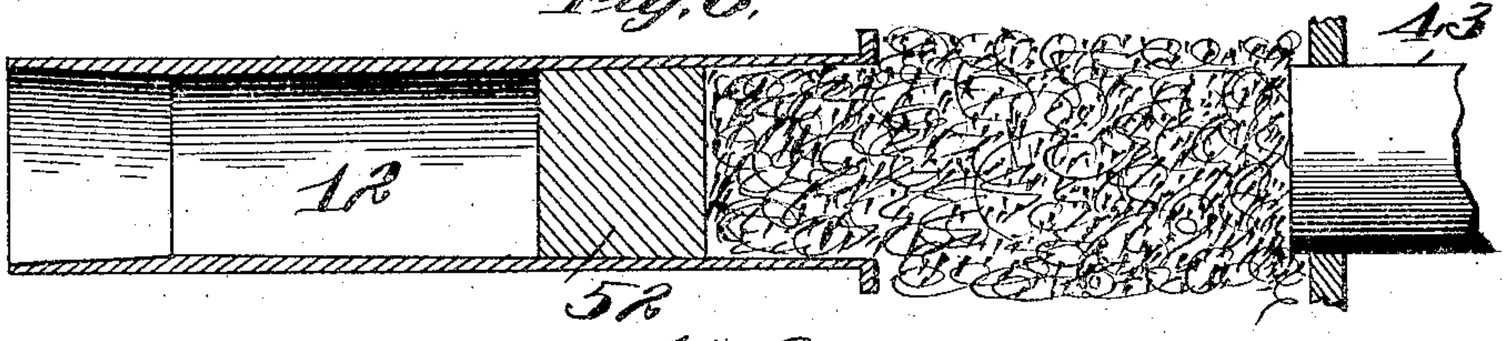


Fig. 9

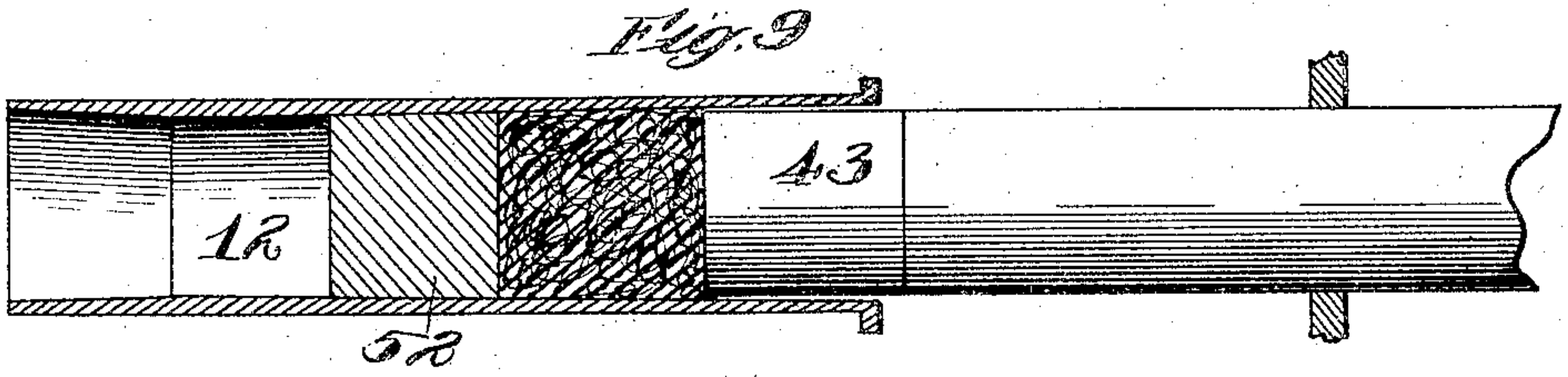


Fig. 10

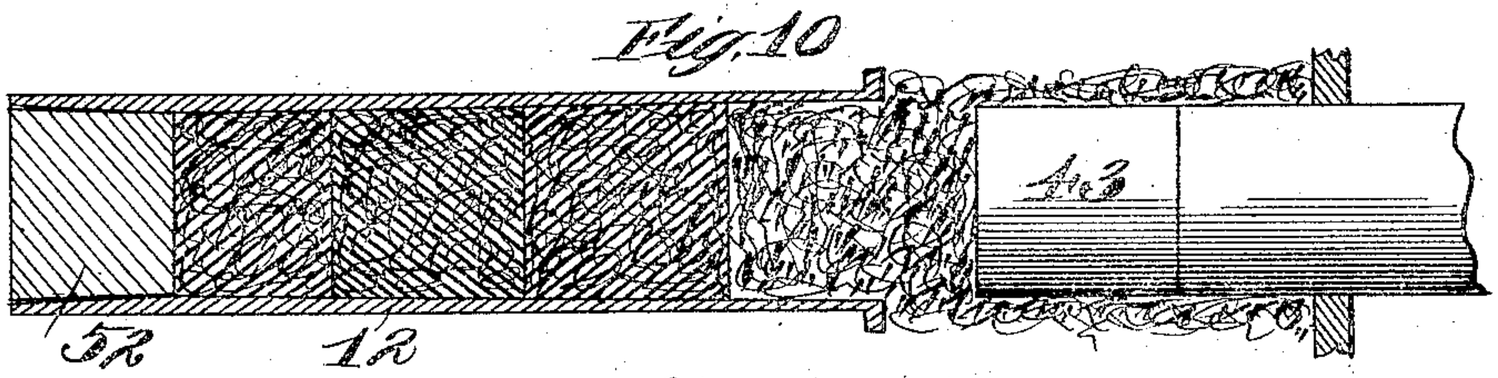


Fig. 11.

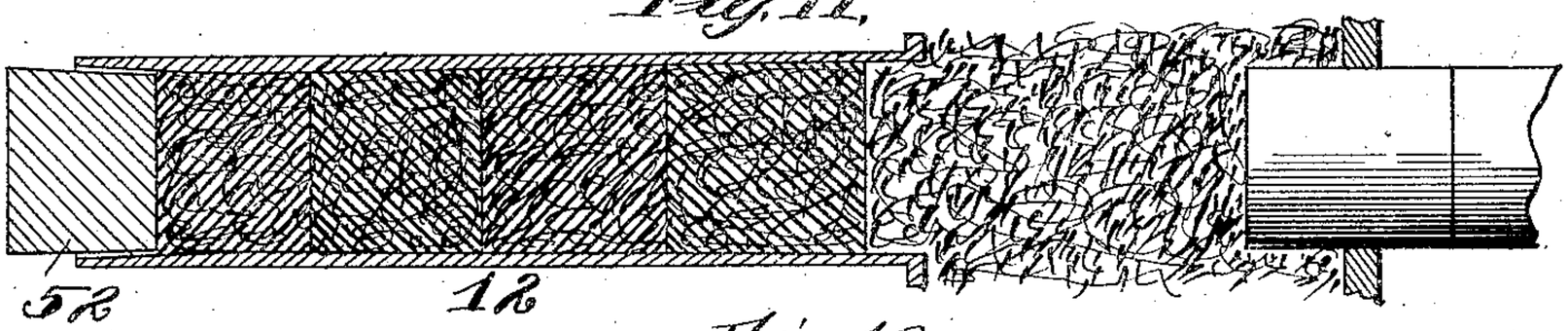
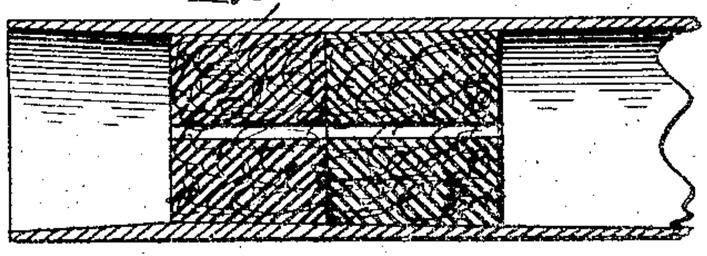


Fig. 12



Witnesses:

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UNITED STATES PATENT OFFICE.

FRANK E. ABBOTT, OF BUFFALO, MINNESOTA.

BRIQUET-MAKING MACHINE.

No. 896,427. Specification of Letters Patent. Patented Aug. 18, 1908.

Application filed September 2, 1905. Serial No. 276,883.

To all whom it may concern:

Be it known that I, FRANK E. ABBOTT, a citizen of the United States, residing at Buffalo, in the county of Wright and the State of Minnesota, have invented certain new and useful Improvements in Briquet-Making Machines, of which the following is a specification.

This invention relates to that class of machines intended to produce briquets by subjecting the material or materials to be formed into briquets to a high degree of pressure, and refers particularly to improved mechanical means adapted to exert such pressure and produce briquets at a very rapid rate and with a comparatively small amount of power.

The invention refers further to means for imparting several successive compressions to the material being acted upon thus giving its molecules an interval of time after each compressive movement to adjust themselves in their new relative positions.

In the accompanying drawings, Figure 1 is a perspective view partly in section of a briquet making machine embodying the features of this invention showing the cover plates and the feeding chutes removed. Fig. 2 is a longitudinal vertical central sectional view of said machine. Fig. 3 is a transverse vertical sectional view on the axial line of the cam shaft. Fig. 4 is a transverse vertical sectional view taken on dotted line 4 4 of Fig. 2. Fig. 5 is a transverse vertical sectional view taken on dotted line 5 5 of Fig. 2. Figs. 6 to 12 inclusive are longitudinal sectional views of a mold tube; Fig. 6 shows an initial pressure plug in the receiving end of the tube; Fig. 7 shows said plug advanced within said tube by a forward movement of a plunger; Fig. 8 shows the plunger withdrawn and the space it occupied filled with material to be compressed; Fig. 9 shows the plunger as again advanced and the first charge of material compressed within the inner end of the mold tube, the plug having been advanced in the tube; Fig. 10 shows the plunger as compressing a fourth charge and the plug being forced through the most constricted portion of the mold tube into the flaring outer end thereof; Fig. 11 shows the plunger as compressing a fifth charge and forcing the first briquet from the outer end of the mold tube; and Fig. 12 shows the several charges within the mold tube with a hole extending longitudinally through the two outermost charges. This hole is intended to be formed by removing a portion of the substance of the charges, as by drilling, for the purpose of reducing the resistance of the passage of these and succeeding charges through the mold tube, and thereby reducing the pressure, both circumferential and longitudinal, placed upon the charges in their formation into briquets.

In the embodiment herein shown and described of this invention I provide a base 1, formed of cast iron or other suitable material, upon which base a body portion 2 rests and is secured by means of bolts 3 extending through coinciding integral ears 4 extending from the base and the body portion respectively. The body portion 2 comprises side pieces 5 and stationary head blocks 6, the side pieces being secured to the head blocks by tap-bolts 7. To guard against the tap bolts 7 being sheared off by the pressure exerted by the machine, I insert studs 8 into suitable openings formed in the sides of the head blocks 6 which studs project from said head blocks and lie within corresponding openings in the side pieces 5. The two head blocks 6 are also secured together by means of the rods 9, having cap nuts 10 upon their screw threaded ends; but inasmuch as these rods are also guide rods for a reciprocatory part of the mechanism I will hereinafter designate them by said last mentioned title.

Each of the head blocks 6 is provided with a number of openings 11 extending therethrough, which openings are adapted to receive mold tubes 12 through which tubes material is forced and within which the compressive power is applied. The mold tubes 12 are each provided at one end with an integral ring or collar 13 adapted to lie within a corresponding counterbored recess 14 in the inner face of the head blocks 6. From the inner or receiving ends of the mold tubes their inner diameters diminish through about four-fifths of their length and their opposite outer ends are of slightly increasing diameter, or flaring. In the present instance I have provided each stationary head block 6 with nine of the mold tube openings 11, and have formed the mold tubes of chilled cast iron, finished by grinding to an outer diameter exactly corresponding with the diameter of said mold tube openings. Other material than chilled iron may be employed, but I have found it to be reasonably well adapted to the purpose and requirements.

As the internal diameter of the mold tubes 12 governs the external diameter of the

briquets it is apparent that within the limitations of the diameter of the openings 11, the internal diameter of the mold tubes may be varied and the size of the briquets produced by the machine thus altered.

Each of the stationary head blocks 6 is cored out in its interior to form a chamber 15 surrounding the walls of the openings 11 which is for the purpose of admitting steam to the interior of said head blocks to heat the mold tubes 12 thus preventing the material passing through the mold tubes from chilling upon the inner surface of said tubes and clogging the action of the machine. A tubular boss 16 is formed upon the upper side of each of said stationary head blocks 6 and is internally screw-threaded to receive a pipe 17 by means of which steam is conducted to the chamber 15 and the lower part of said chamber is provided with a drip cock 18 to permit of the withdrawal from said chamber of the condensation.

A cam shaft 19 extends transversely through the body portion 2 of the machine and is rotatably supported in bearings 20 formed integral with the side pieces 5. At one side of the machine the cam shaft 19 extends beyond its bearing 20 and carries a spur gear wheel 21 fixed upon said shaft. A drive shaft 22 supported upon arms 23 extending upwardly from the side pieces 5, carries at one end a belt wheel 24 loosely mounted upon said drive shaft 22, but having a frictional clutch connection therewith and at its other end a pinion 25 fixed upon said shaft and being adapted to mesh with the teeth of the spur gear wheel 21. A clutch lever 26 operates the friction clutch connecting the belt wheel 24 and the drive shaft 22.

Within the body portion 2 of the machine the cam shaft 19 carries a cam 27 fixed upon said cam shaft, which cam has upon its periphery an integral raised annular rib 28. A bearing block 29 formed in two parts and having an inner peripheral channel 30, adapted to contain the cam rib 28, surrounds said cam and receives a combined reciprocal and vertical motion upon the rotation of the latter.

The bearing block 29 forms a part of a reciprocating head 32, which head comprises also two end plates 33, which at their upper and their lower edges have integral bearing sleeves 34 adapted to surround the guide rods 9 and contain bearing bushings 35. Wear in the bushings 35 may be taken up in any suitable manner; in the present instance I have employed a sort of pinch fit adjustment, each of the bushings and bearings being split at their outer sides, a screw 36 providing means within certain limits for increasing or diminishing the size of the bearing opening. The two end plates 33 are secured in position with relation to each other by means of shoulder bolts 37. The two-part bearing block 29 is adapted to lie between the adjacent faces of the end plates 33 and to have a vertical reciprocatory movement with relation to said plates which movement is imparted to said bearing block by means of the cam 27.

The inner faces of the plates 33 and the corresponding faces of the bearing block are provided with oil grooves 38 for lubricating the contacting surfaces, and the moving parts of the mechanism are inclosed by the removable cover plates 39. The outer face of each of the end plates 33 is provided with openings 40 corresponding in number and coinciding in position with the mold tube openings 11 in the stationary head blocks 6. These openings 40 are internally screw threaded and are adapted to receive plungers 41 similarly screw-threaded upon their rear ends. To fix said plungers in position with relation to the end plates 33 I provide lock nuts 42 adapted to be turned upon the screw threads of the plungers before said plungers are screwed into the threaded openings 40. The forward ends of the plungers 41 are provided with removable crowns 43 the body portions of the plungers being provided with axial internally screw-threaded openings 44 adapted to receive the screw threaded stems 45 of said crowns 43.

The plungers 41 pass through suitable openings in a shield plate 46, one at each end of the machine, said shield plates 46 forming with the inner side of the stationary end blocks 6 receptacles 47 within which a quantity of the material to be compressed is placed. Owing to the fact that the plungers reciprocate with relation to the plates 46 I provide a packing 48 of leather or other suitable material secured to the rear faces of each of said plates 46 by means of a plate 49 and screws 50. The packing material is in sheet form, and is provided with openings of a diameter just sufficient to receive the plungers 40 upon their rearward movement. The material to be compressed is conducted to the receptacles 47 at the opposite ends of the machine through feed chutes 51 and by the reciprocation of the plungers 41 is forced a quantity at a time into the open inner ends of the mold tubes 12. The small quantity of material forced into each mold tube upon the forward reciprocation of its plunger, I have denominated a "charge". When the final pressure of the machine has been imparted the charge becomes a briquet.

In making briquets of coal, lignite, etc., the material is reduced, as by crushing it to pass through a screen of say one-eighth inch mesh, and is heated to a temperature only slightly below that of combustion. By heating the material coal tar is liberated and this coal tar forms the binder for the briquets. If the material is deficient in coal tar a quan-

tity of such tar or other suitable material must be added as a binding agent. In making briquets from ores containing precious metals ordinary lime, slaked to a "cream" is used as a binder and is added to the ores in suitable quantities. The prepared material, either coal, lignite, or other material to be made into briquets, mixed with its binder is conducted to the receptacles 47 at opposite ends of the machine through the chutes 51. The plungers 41 reciprocate within the receptacles 47 and in the present embodiment enter the inner ends of the mold tubes a distance of about three inches upon their forward movement.

In order to provide a backing against which the first charge of material will be compressed within each of the mold tubes by its advancing plungers, I form plugs 52 of wood or other compressible material and insert one of said plugs in the inner end of each of the mold tubes 12 at both ends of the machine. The first subsequent reciprocation of the plungers 41 forces all of the plugs into the tubes the distance of the forward movement of said plungers within the tubes. The second forward movement of the plungers forces a quantity of briqueting material into the tubes compressing said material and driving the plugs a farther distance into the tubes. At each successive forward reciprocation of the plungers additional charges are inserted into the mold tubes 12 and are compressed and advanced within said tubes. As soon as the plugs 52 pass the most constricted point within the mold tubes, pressure upon them is relieved and they are forced from the tubes through the slightly flaring ends of said tubes, falling from the machine into conveyer buckets (not shown) upon an endless conveyer belt (not shown) or into suitable receptacles to be removed by hand from the machine.

In the present embodiment of my invention I have formed the mold tubes with their most constricted point about four-fifths of their length from their receiving ends; thus in the action of the machine a constricting pressure is applied to the several charges upon each of four separate advances within the tube before said charge emerges through the most constricted point and enters into the flaring end of the tube. An interval of time elapses between each advance movement of the charge within the tube, during which time the molecules of the material being compressed have an opportunity to adjust themselves in their new relative positions.

The longitudinal pressure exerted by the plunger upon the charge of material being compressed depends upon the resistance offered to the forward movement of the preceding charges within the tube and the amount of this resistance is governed by the initial resistance to the passage of the plug 52 within the tube, therefore, the initial resistance and consequently the subsequent resistance, is governed by making the plug fit the tube more or less closely. The length of the plug also has an influence upon the resistance of its passage; in practice I make it from two to three inches in length.

On account of the adhesion of the charges of material to the inner walls of the tubes the tendency of the machine is to increase the initial pressure during its operation. When the pressure upon the charge becomes greater than is desirable it may be reduced by drilling a hole longitudinally of the tube through one or more of the charges in each tube before the foremost of said charges has been subjected to the final pressure that is to say, to the forward movement that forces it through the most constricted portion of the tube. Drilling said hole in the charges removes enough material to permit of a slight reduction of the circumference of the briquet that emerges from the constricted portion of the tube, diminishing the resistance of the passage of the charge through the tube, and consequently reducing the pressure necessarily exerted by the plunger upon the newly compressed charge in the inner end of each tube to advance the several charges within the tube.

As the compressed material emerges from the tube it readily separates into cylindrical briquets of a length slightly less than the distance of the advance movement of the plungers within the tubes. The openings in the mold tubes may be square, octagonal, or of other forms, and the briquets produced by the machine will be altered accordingly.

It is apparent that many changes may be made in the embodiment of this invention without departing from the spirit and scope thereof wherefore I desire to have it understood that I do not limit myself to the form herein shown and described but desire to claim said invention broadly in its various forms, applications and adaptations.

I claim as my invention:

In a press, in combination, a supporting frame comprising a plurality of guide rods; feeding means; compression devices comprising two plunger-heads connected together and provided with plungers, said plunger heads being slidably supported on said guide rods; a shaft rotatably mounted in said frame; a cam on said shaft provided with a peripheral rib; and a two-part bearing block lying between and slidable upon said plunger-heads and bearing upon said cam, said block having an annular groove adapted to receive the rib on said cam.

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