(No Model.)

3 Sheets—Sheet 1.

J. S. GRIFFIN.

MACHINE FOR FORMING PROJECTILES.

No. 509,730. Patented Nov. 28, 1893.

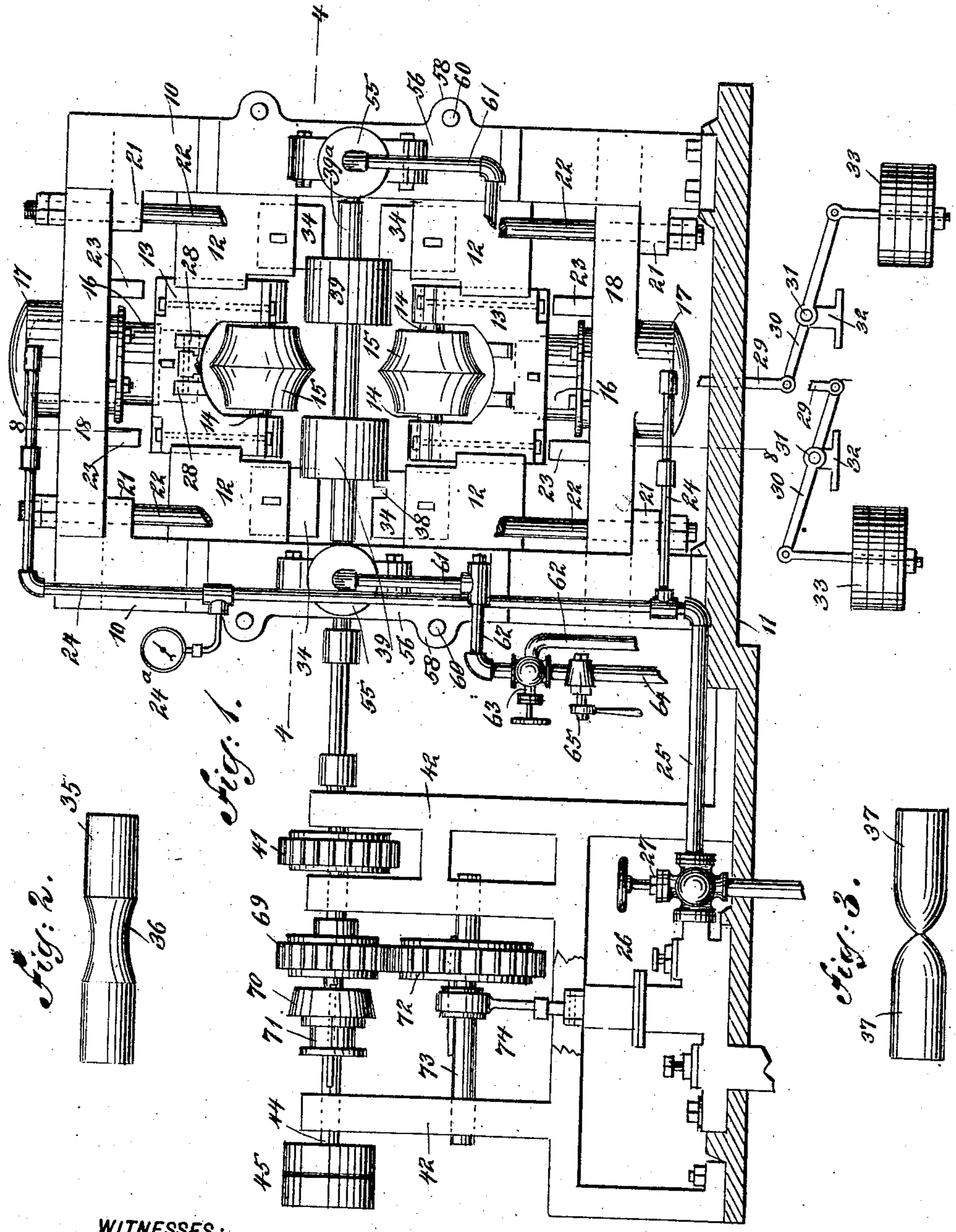

Fig. 1.

Fig. 2.

Fig. 3.

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(No Model.) 3 Sheets—Sheet 2.

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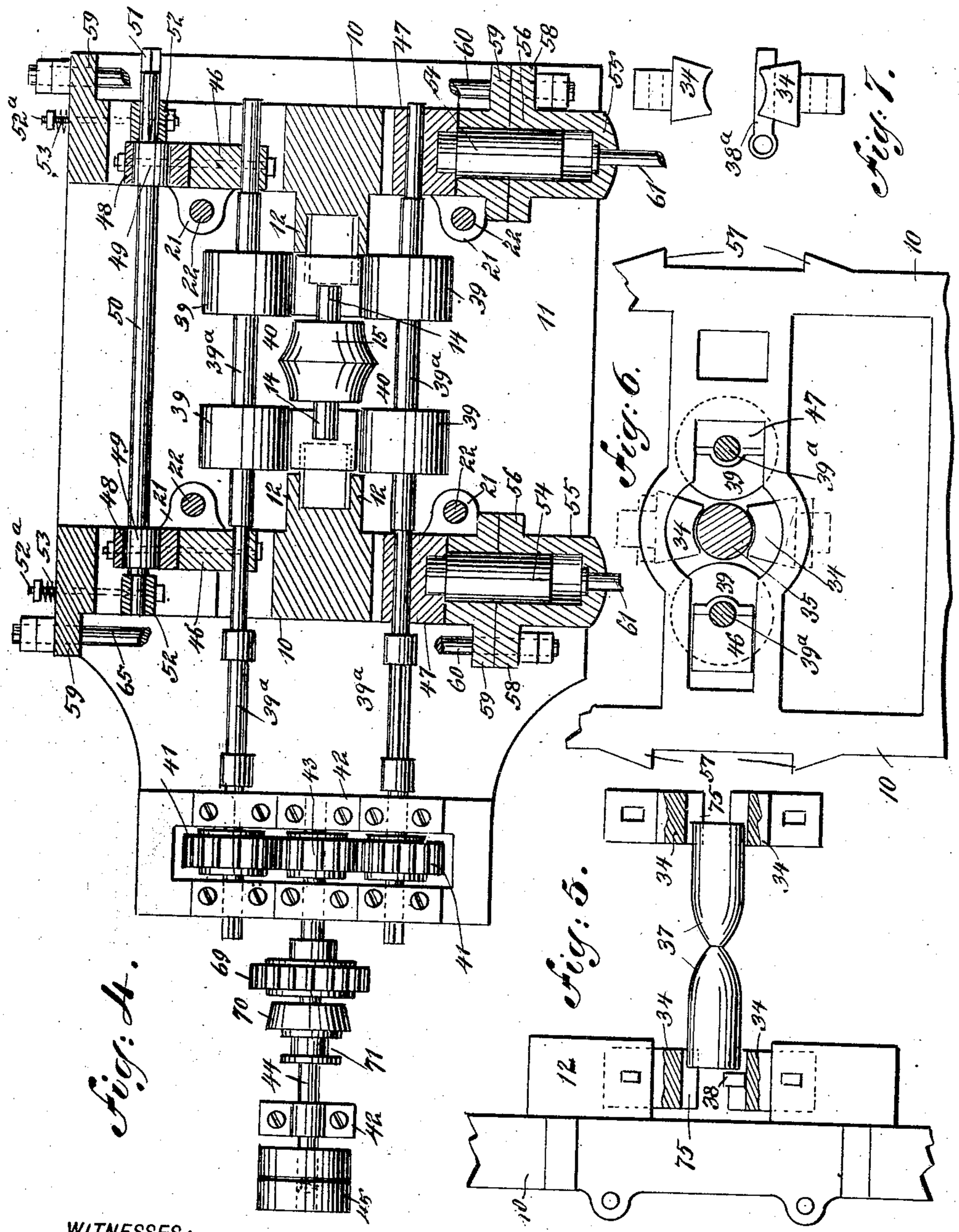

Fig. 4.

Fig. 6.

Fig. 7.

Fig. 5.

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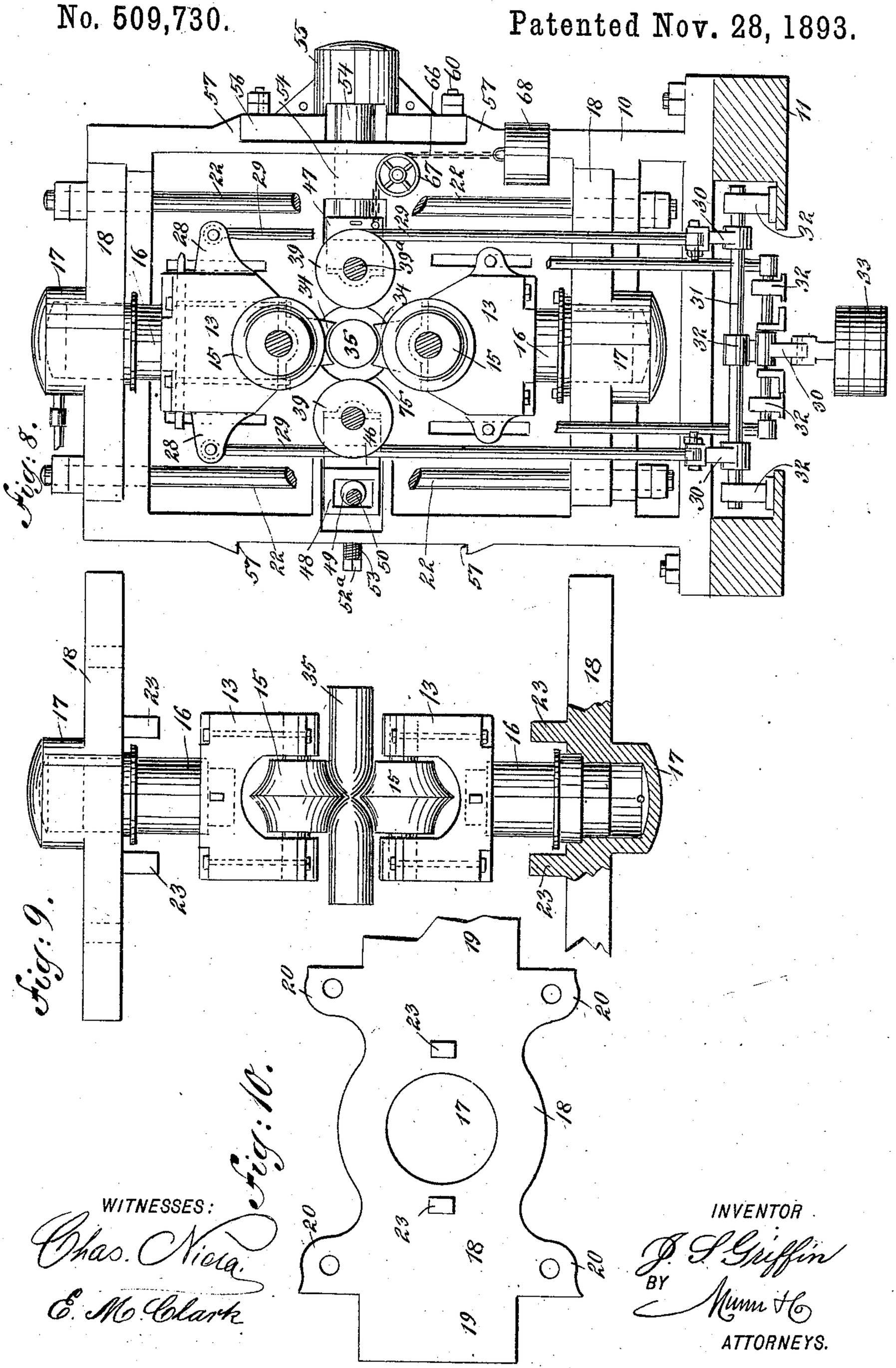

Fig. 8.

Fig. 9.

Fig. 10.

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UNITED STATES PATENT OFFICE.

JOHN STEWART GRIFFIN, OF ROSLYN, WASHINGTON.

MACHINE FOR FORMING PROJECTILES.

SPECIFICATION forming part of Letters Patent No. 509,730, dated November 28, 1893.

Application filed September 15, 1893. Serial No. 485,539. (No model.)

To all whom it may concern:

Be it known that I, JOHN STEWART GRIFFIN, of Roslyn, in the county of Kittitas and State of Washington, have invented a new and improved Machine for Forming Projectiles, of which the following is a full, clear, and exact description.

My invention relates to improvements in that class of machines which are used in forming projectiles for cannon and other firearms, and especially to such as are used for forming what are known as conical projectiles.

The object of my invention is to produce a strong and simple machine by which these projectiles may be rapidly formed two at a time, and also to produce a machine which may be perfectly controlled by the operator and which rolls the projectiles in perfect shape, so that they are adapted for accurate firing.

To these ends my invention consists of certain parts and details, and combinations of the same, as will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the machine embodying my invention. Fig. 2 is a detail view of a prepared ingot from which a projectile is formed. Fig. 3 is a detail view of the double projectile after it is rolled from the ingot. Fig. 4 is a sectional plan on the line 4—4 of Fig. 1. Fig. 5 is a broken detail sectional view showing the position of the ingot or blank in the guide blocks and showing the stop bar which limits the inward movement of the ingot as the latter is thrust into the machine. Fig. 6 is a detail sectional view showing the relative position of the ingot, its supporting guide blocks, and the rollers which revolve the ingot. Fig. 7 is a detail view of the guide blocks and the stop bar for one of the blocks. Fig. 8 is a vertical section of the machine on the line 8—8 of Fig. 1. Fig. 9 is a detail view with parts in section, of the forming rolls and the hydraulic cylinders which move the rolls vertically; and Fig. 10 is a broken detail plan of one of the hydraulic cylinders and its supporting plate.

The machine is provided with a substantial frame having opposite end pieces or standards 10, which are firmly secured to a supporting base 11. These standards have on their inner sides, guide ribs 12, which are arranged in pairs on each standard, above and below the central portion of the standard, so that they may support, in a proper position, the guide blocks for the ingot, from which the projectiles are formed, as hereinafter described, and these ribs 12 also serve as guides for the vertically-movable piston heads 13, which are arranged in the upper and lower portions of the machine, and move alternately toward and away from each other, as the ingot is rolled and the projectiles completed.

The piston heads 13 have journaled in their adjacent faces, the trunnions 14 of the forming rolls 15, which rolls align vertically and have convex faces, the face of each roll having a sharp edge extending annularly around it in the center and the rolls when formed in this way, are adapted to make conical projectiles, but it will be understood that the rolls may be given any necessary shape so that they may have the proper shaping effect on the material with which they come in contact.

The piston heads 13 are secured to pistons 16 which are operated like the usual hydraulic pistons, and they are held to move in hydraulic cylinders 17, arranged at the top and bottom of the machine, each cylinder being formed integral with the plate 18, which is shown in detail in Fig. 10, and which has projecting ends 19 to lie upon the tops of the standards 10, and on the lower portions of the standards, according as to whether the plate is at the top or lower portion of the machine. The plates 18 are also provided with lugs 20 which lie upon lugs 21, projecting inward from the standards 10, near the top and bottom of the standards, as shown clearly in Fig. 1, and bolts 22 extend vertically through each set of lugs on the plates 18 and standards 10, so that the plates are held firmly in place, and as the bolts are provided with the usual form of nuts which are securely tightened, the strain is taken from the machine frame to a great extent, and imparted to the bolts. The upper plate 18 has depending lugs 23 on

its under side and similar lugs are provided on the upper side of the lower plate 18, these lugs serving as abutments for the piston heads and the piston heads rest against them when the pistons are in a normal position.

The cylinders 17 are supplied with water through pipes 24 and 25, the latter connecting with a common form of force pump 26, or with any other means of forcing water under pressure into the cylinders, and the pipe 25 which is the supply pipe, is provided with a drain cock 27, which may be opened when the water is to be exhausted from the cylinders, and the pistons are to resume their normal positions. The upper piston head 13 has, on opposite sides, lugs 28, in which are pivoted depending rods 29, which extend downward to the base of the machine and are pivoted to levers 30, each lever being fulcrumed on a shaft 31 journaled in suitable supports 32 and provided at the opposite side to that to which the rod is secured with weights 33, which serve as a counterbalance, and the weights 33 serve to return the piston and piston head when the water has been withdrawn from the upper cylinder 18.

In the drawings, I have not shown counterbalancing weights applied to the lower piston head, but it will be understood that such weights will be applied in any convenient manner.

The ribs 12 on the inner side of the standards, besides acting as guides for the piston heads as specified, form supports for the guide blocks 34, which blocks are shown clearly in Fig. 7, and the blocks are arranged in pairs on opposite sides of the machine, above and below the central part thereof, the blocks being firmly secured to the guide ribs, and having their adjacent faces concaved as shown in the drawings, so that the cylindrical ingot 35 which is held between them may turn readily and still be held in the proper position.

The ingot 35 is prepared for the machine by slightly reducing it in the center, as shown at 36, in Fig. 2, as this prevents too much metal from being crowded toward the shoulders of the projectiles when the latter are formed. The projectiles 37 are formed in pairs as shown in Figs. 3 and 5, the convex faces of the forming rolls 15 cutting transversely into the central portion of the ingot and forcing the metal which is heated, aside, as hereinafter described. The lower guide block 34 on the inner portion of the machine is provided with a slot 38 which is formed in the top of the block and extends at right angles to the axis of the forming rolls, this slot being adapted to receive a stop bar 38^a, which extends into the path of the ingot when the latter is pushed into the machine, and thus causes the ingot to be held in the proper position. As above explained the forming rolls 15 are forced against the ingot from above and below it, and to provide for revolving the ingot and at the same time hold it firmly in place, rollers 39 are employed which are arranged in pairs on opposite sides of the central portion of the machine in which the ingot is held, and these rollers 39 are adapted to approach the ingot horizontally, and when they are forced against the ingot, it will be seen that the latter will be clamped on four sides so that it is held very securely. The relative positions of the driving rollers, the forming rolls, and the ingot are clearly shown in Fig. 8.

The rollers 39 are arranged in pairs, as specified so that an open space 40, (see Fig. 4,) may be left to provide for the vertical movement of the forming rolls 15. The rollers 39 are preferably formed integral with their shafts or spindles 39^a, and the latter are journaled in the horizontally-sliding boxes, as described below and projecting from the inner end of the machine, being journaled in a supporting frame 42, and having their projecting ends provided with gear wheels 41 which are driven by a third gear wheel 43, on a shaft 44, this being also journaled in the frame 42 and having the usual tight and loose pulleys 45, as shown clearly in Figs. 1 and 4. This arrangement causes the rollers 39 on opposite sides of the ingot to be turned in opposite directions, so that when the rollers are pressed against the ingot, they will cause the latter to revolve.

The shafts 39^a of the rollers are mounted in horizontally-sliding boxes 46 and 47, which move in suitable slideways in the standards of the frame, and it will be understood that provision must be made in the frame 42 for the proper sliding of the shafts. The boxes 46 are provided with openings or recesses 48 in which turn eccentrics 49 which are secured to a shaft 50, the latter having a square end 51, to which a crank may be applied to turn it. It will thus be seen that by turning the crank, the cams or eccentrics 49 may be turned so as to throw the two boxes inward, and thus carry one set of rollers 39 quickly to place against the ingot 35.

The shaft 50 is provided with sleeves 52, at its ends, to which are secured bolts 52^a, which slide in the main frame and are normally pulled outward by springs 53, these springs acting as a counterbalance for the shaft 50, and holding the shaft normally in a retracted position. The boxes 47 of the opposite shaft 39^a are coupled directly to pistons 54, which move in horizontal hydraulic cylinders 55, these cylinders having, near their open ends, plates 56 which lie between lugs 57 on the edges of the standards 10, as shown in Figs. 6 and 8, and the plates 56 are also provided with lugs 58, which fit against lugs 59 on the standards and the plates are fastened securely in place by bolts 60. Water is supplied to the cylinders 55 through pipes 61 and 62, the latter connecting with a suitable source of supply, and being provided with a controlling valve 63. A drain pipe 64 opens from the pipe 62 and is controlled by a cock

65, so that the water may be exhausted from the cylinders 55 when necessary.

It will be seen that any suitable pipe system may be employed for supplying the cylinders 55 and also the cylinders 17 with water, and that pressure gages 24ª, similar to that shown in Fig. 1, will be connected with the pipes to indicate the pressure thereon. It will be observed that an independent water supply is provided for the sets of cylinders 17 and 55, so that the forming rolls 15, and the driving rollers 39 may be independently moved when desired.

The boxes 47 and pistons 54 which carry the shaft 39ª, are pulled back into normal position by chains 66 which are secured to the boxes and extend over the guide wheels 67 on the sides of the machine frame, and weights 68 which are secured to the chains.

A convenient mechanism for operating the force pump 26, which supplies water to the pistons 17, is shown in Figs. 1 and 4, though other driving mechanism may be employed.

As illustrated the loose gear wheel 69 on the shaft 44 is adapted to be engaged by a common form of friction cone 70, which slides on the shaft and which is provided with the usual groove 71 to receive a lever by which the cone may be thrown into gear with the gear wheel thus locking the latter to the shaft. The gear wheel 69 meshes with a gear wheel 72 on the counter shaft 73, thus being journaled in the frame 42 and connected by a common form of eccentric and rod 74 with the force pump.

The frame of the machine has openings 75 on opposite sides near the center so that the ingots and projectiles may be pushed endwise through the machine, and the machine is operated as follows: The stop bar 38ª is placed in one of the guide blocks 34 and the heated ingot 35 to be shaped is pushed endwise into the machine between the upper and lower guide blocks 34 until its inner end reaches the stop bar. The stop bar is then removed and the rollers 39 forced horizontally inward against the sides of the ingot by means of the eccentric and hydraulic mechanism already described, after which the shaft 44 is set in motion and the rollers 39 by means of their gear connection with said shaft are revolved, and they revolve the ingot. The water is then turned into the cylinders 17 so that the shaping rolls 15 are forced vertically against the ingot and these rolls revolve by friction with the ingot. In this manner, the four rolls which press against the ingot are constantly revolved, and as the ingot is also revolved two perfect projectiles are formed, as shown in Fig. 2.

The form of the frame which I have shown is well adapted for supporting the rollers and other operative parts of the machine, but it will be understood that any suitable frame may be employed and it will also be understood that the shaping rolls and the driving rollers may be moved toward and away from the ingot either by hydraulic mechanism, as shown or by an eccentric mechanism similar to that shown in Fig. 4, and operated by the shaft 50.

This machine, as described, is especially intended for forming projectiles but it will be seen that the shaping rolls may be made so as to form other articles if desired without departing from the principles of the invention.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A machine of the kind described, comprising a set of shaping rolls movable toward and from each other, revoluble driving rollers movable toward and away from each other, and held to slide in planes at right angles to the sliding planes of the shaping rolls, and supporting blocks to hold the blank centrally between the rolls and rollers, substantially as shown and described.

2. A machine of the kind described, comprising a set of vertically-movable shaping rolls, a set of driving rollers held in horizontally-sliding bearings, and supporting-guide blocks at opposite ends of the shaping rolls, substantially as shown and described.

3. A machine of the kind described, comprising oppositely-arranged piston heads adapted to move toward and away from each other, mechanism for operating the piston heads, shaping rolls journaled in the piston heads, and oppositely-arranged revoluble driving rollers held in bearings arranged in planes at right angles to the sliding plane of the shaping rolls, substantially as shown and described.

4. A machine of the kind described, comprising oppositely-arranged piston heads held to slide toward and away from each other, hydraulic cylinders and pistons for operating the piston heads, shaping rolls journaled in the piston heads, and driving rollers mounted in slidable bearings and held to move toward and away from each other in planes at right angles to the planes of the sliding piston heads, substantially as shown and described.

5. A machine of the kind described, comprising a supporting frame having guide ribs on its inner sides, piston heads held to slide toward and away from each other between the guide ribs, shaping rolls journaled in the piston heads, oppositely-arranged guide blocks near the ends of the shaping rolls, and revoluble driving rollers held in slidable bearings and adapted to move toward and away from each other in planes at right angles to the planes of the sliding piston heads, substantially as shown and described.

6. The combination with the vertically-movable and revoluble shaping rolls, of the revoluble driving rollers having their bearings held to slide in planes at right angles to the sliding planes of the shaping rolls, and

means, as the eccentric and hydraulic mechanism, for moving the driving rollers, substantially as shown and described.

7. The combination with the shaping rolls, and driving rollers arranged to move in slidable bearings at right angles to each other, of the guide blocks arranged near the ends of the shaping rolls, and a stop bar held in one of the guide blocks, substantially as shown and described.

JOHN STEWART GRIFFIN.

Witnesses:
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JAMES HERON.