

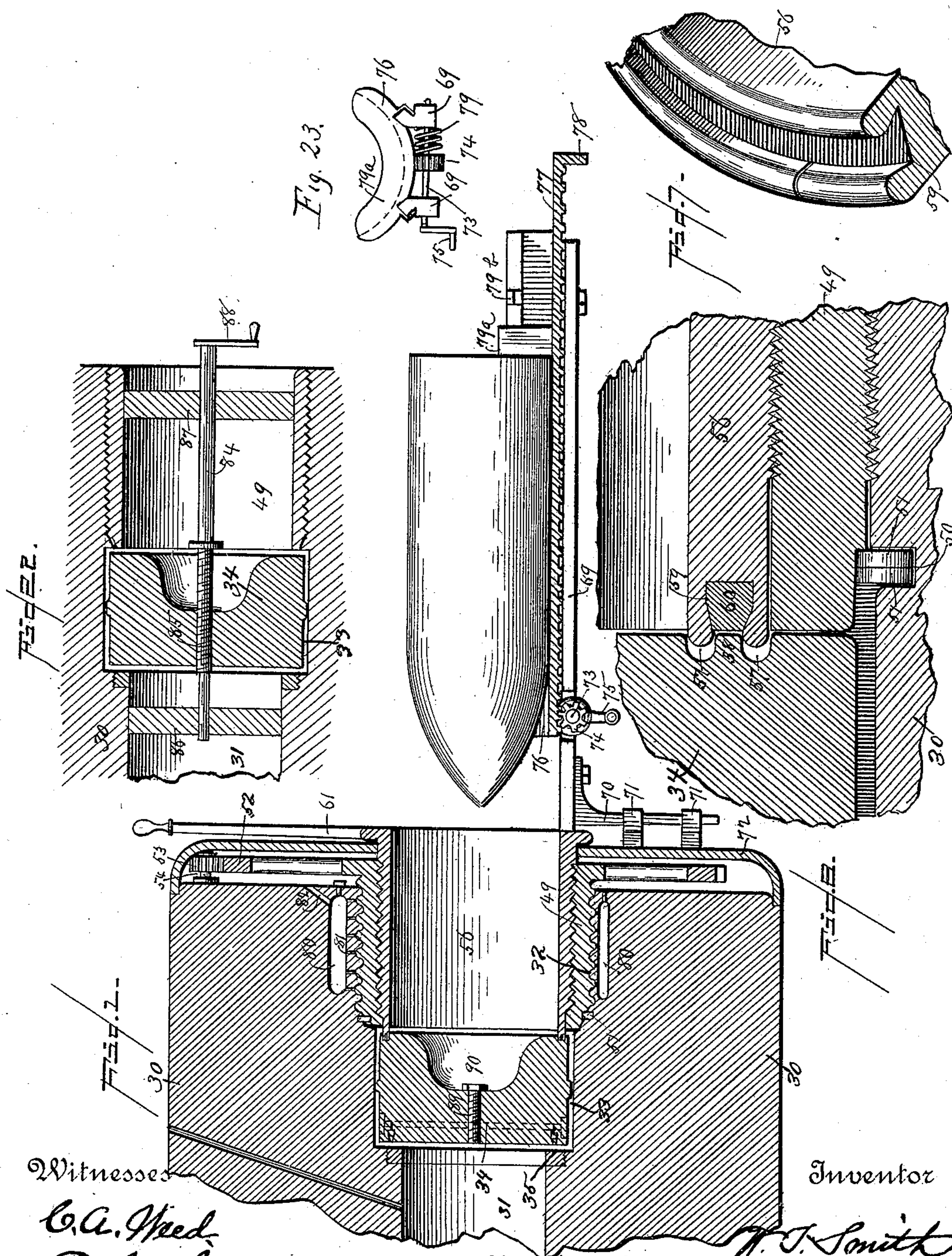
(No Model.)

4 Sheets—Sheet 1.

W. T. SMITH.  
BREECH LOADING ORDNANCE.

No. 389,983.

Patented Sept. 25, 1888.



Witnesses

C. A. Reed,  
R. E. Somes.

Inventor

By his Attorney,

W. T. Smith,  
H. E. Somes.



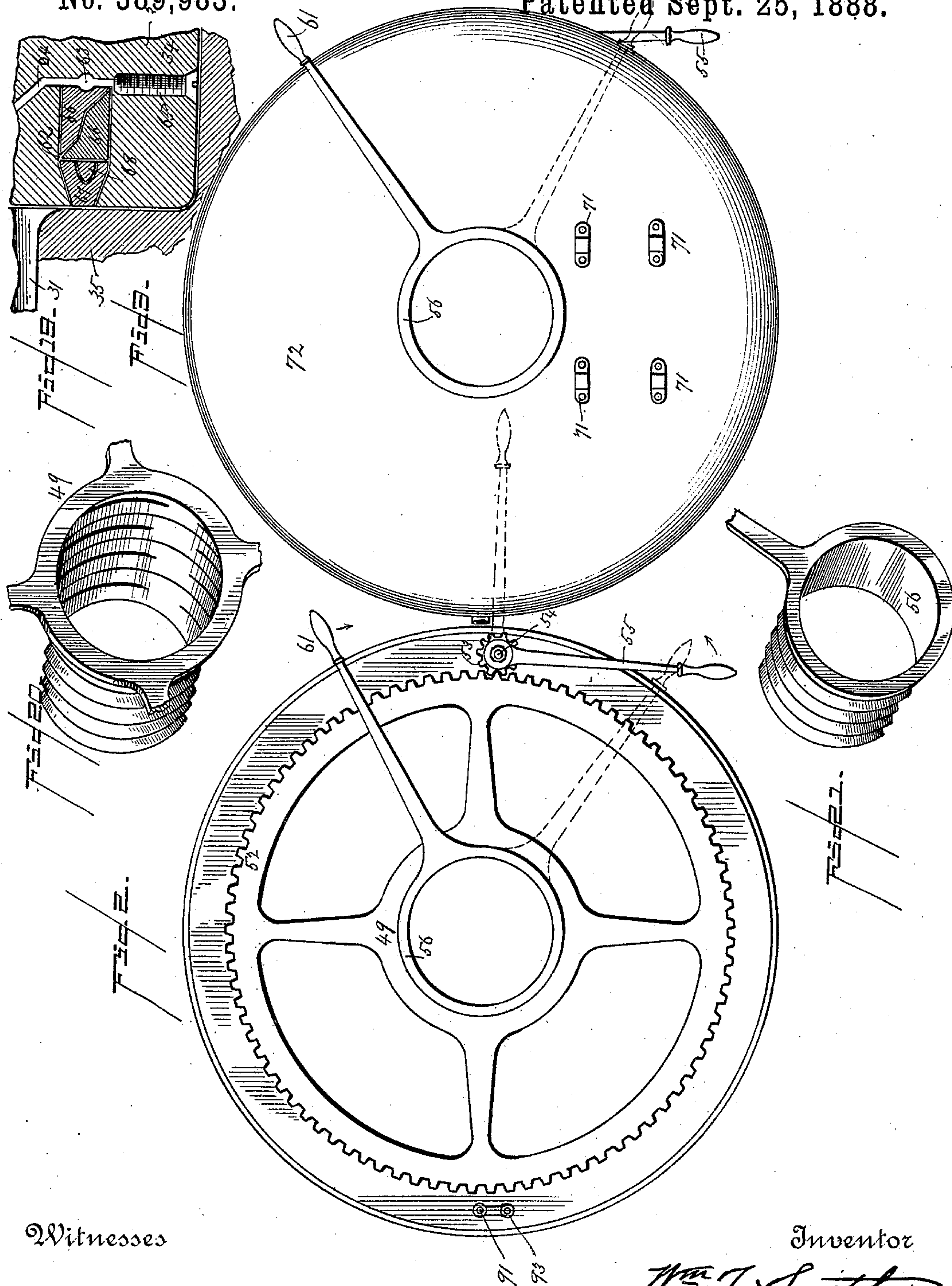
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Witnesses

*Jos. A. Ryan  
& Co. Secy.*

By his Attorney

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Inventor

*W. T. Smith*



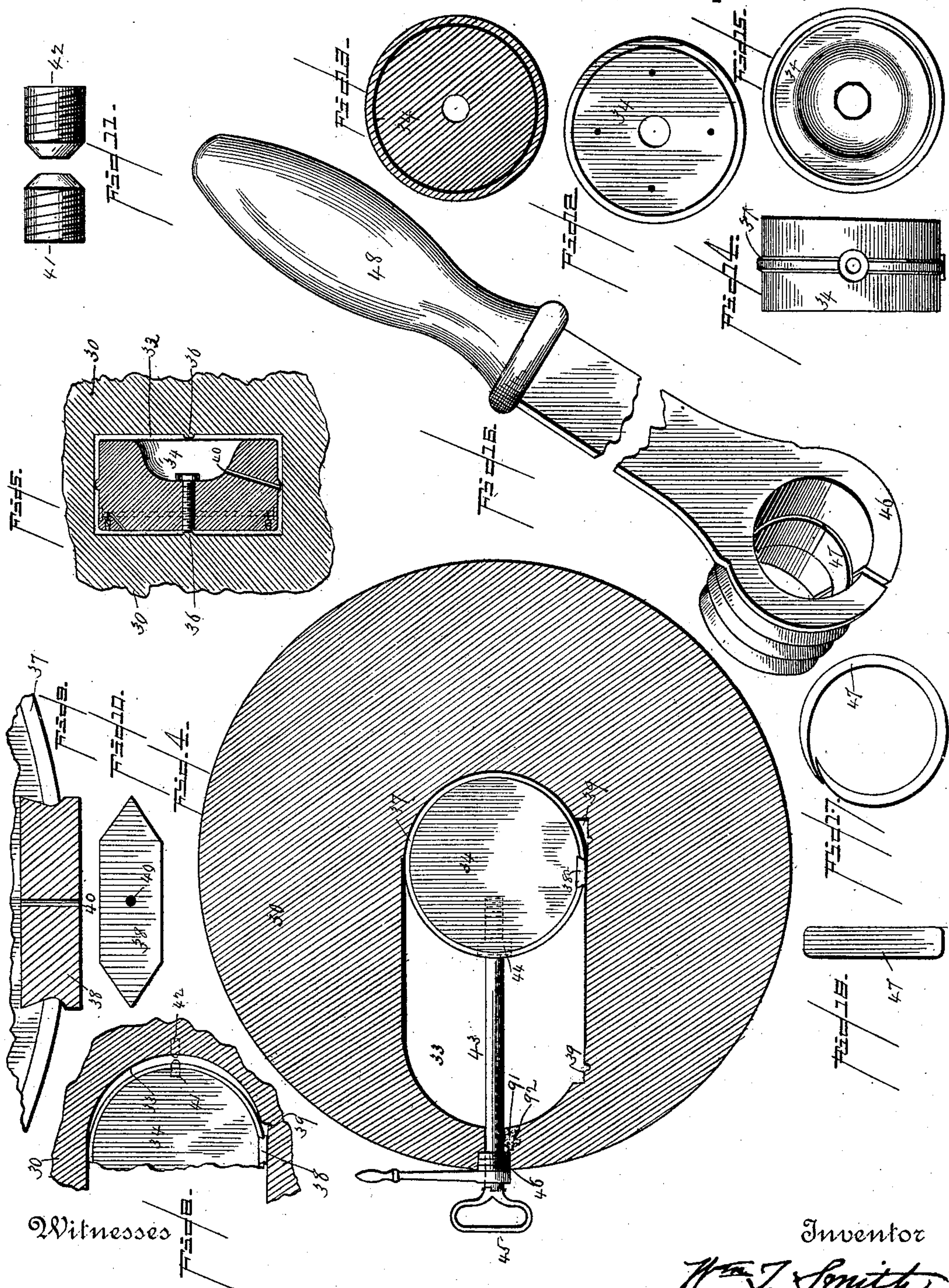
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Witnesses

Jas. A. Ryan  
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By his Attorney

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(No Model.)

4 Sheets—Sheet 4.

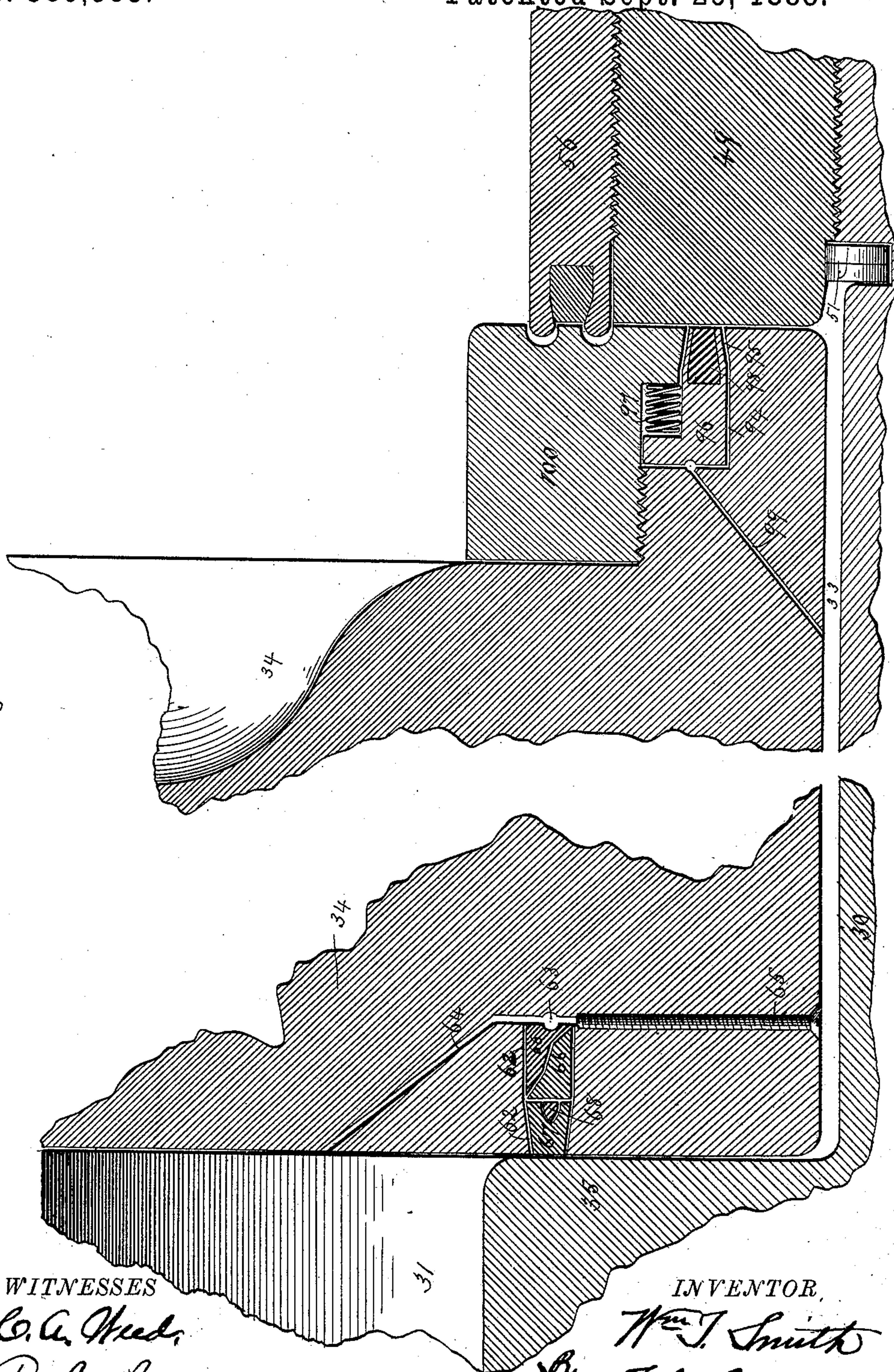
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Fig. 24.



WITNESSES

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# UNITED STATES PATENT OFFICE

WILLIAM T. SMITH, OF BIRMINGHAM, ALABAMA.

## BREECH-LOADING ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 389,983, dated September 25, 1888.

Application filed March 22, 1888. Serial No. 268,132. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM T. SMITH, a citizen of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented certain new and useful Improvements in Breech-Loading Cannons, of which the following is a specification.

The object of this invention is to provide a breech-loading cannon which can be loaded with great rapidity and facility, and in which the joints at the breech can be closed gas-tight.

Figure 1 of the accompanying drawings is a longitudinal section through the breech of this improved breech-loading cannon, showing the breech-block in position to be locked against its seat at the rear of the bore and the loading device in position for loading when the breech is open. Fig. 2 is an end elevation of this improved breech-loading cannon with the cap for covering the face of the breech removed.

Fig. 3 is an end elevation of the breech with the cap or cover in position thereon. Fig. 4 is a transverse section through the body of the gun on a line passing through the breech-block chamber. Fig. 5 is a section taken longitudinally through a portion of the gun at one side of its axis, the section-line passing through the breech block chamber and through the center of the breech-block therein. Fig. 6 is an enlarged section showing a portion of the body of the gun, of the breech-block, of the tubular breech screw and the tubular calking-thimble, and a section of the gas-check rings.

Fig. 7 is an enlarged perspective view of a portion of the inner end of the calking and packing thimble. Fig. 8 shows a fragment of the breech-block at the inner end of the breech-block chamber. Fig. 9 is an enlarged vertical section of the breech-block shoe in position in the breech-block. Fig. 10 is an enlarged plan of the under side of the breech-block shoe. Fig. 11 is an enlarged view of the abutting screws or stops at the inner periphery of the breech-block and the inner end of the breech-block chamber. Fig. 12 is an elevation of the front face of the breech-block. Fig. 13 is a diametrical section of the breech-block near its front face. Fig. 14 is a peripheral elevation of the breech-block at its outer side. Fig. 15 is a rear elevation of the breech-block. Fig. 16 is an enlarged perspective

view of the split thimble for closing the space around the actuating-rod of the breech-block. Fig. 17 is a side elevation of the soft-metal ring within said closing device. Fig. 18 is an edge view of said ring. Fig. 19 is an enlarged sectional view showing a fragment of the breech-block against its seat in the rear of the bore and the automatic gas-check embodied in said block. Fig. 20 is a perspective view of the tubular breech-screw with the arms supporting the rack broken off. Fig. 21 is a perspective view of the calking or packing thimble. Fig. 22 is an axial section through the rear portion of the bore and through the breech-chamber, showing the means for grinding the joints of the breech-block. Fig. 23 is an end view of the loading device. Fig. 24 is an enlarged section of the breech-block in position opposite the bore, showing the automatic gas-check at its rear and front faces.

Similar numerals of reference indicate corresponding parts in the different figures.

This breech-loading gun is constructed in any suitable manner, either cast or built up, and is composed of iron, steel, or bronze, or a combination of such metals.

The body 30 of the gun is provided in rear of the bore 31 with a breech-chamber, 32, of larger diameter than the bore, and opposite the inner end of the breech-chamber with a lateral slot, forming a breech-block chamber, 33, into which the breech-block 34 slides when the breech is opened. In built-up guns this slot is preferably cut before the last two bands or rings are shrunk on. The annular shoulder at the rear end of the bore and inner end of the breech-chamber constitutes a seat, 35, against which the breech-block rests when closed. This seat is preferably faced with a ring of brass, gun-metal, or other suitable metal softer than steel and of about the hardness of brass. The inner surface of the ring is continuous with the surface of the bore. The front face of the breech-block is ground against its seat to form a tight joint when the breech-block is closed.

The breech-block chamber 33 is recessed on its opposite sides, forming ribs 36, which serve as rests or guides for the breech-block when it is moved into and out of position to be locked. The breech-block is provided with a



circumferential rib, 37, which holds the body of the block out of contact with the top and ends of the breech-block chamber, and it is provided on its bottom with a flat-faced shoe, 5 38, which slides on the bottom of the breech-block chamber. This shoe is tapered at its opposite ends, forming wedge-shaped points, which serve to push aside from its path any particles of dust that may be within the breech- 10 block chamber. The breech-block chamber is provided at opposite ends of the path of the shoe with depressions or cellars 39, for receiving any foreign matter that may be in front of the shoe. The breech-block is provided with 15 an oil-duct, 40, which passes from the recessed rear end of the block through the body thereof and through the shoe for the admission of oil for lubrication. The shoe is dovetailed into the body of the block and is preferably com- 20 posed of soft metal.

The inner end of the breech-block chamber is provided with a stop-screw, 41, and the inner periphery of the breech-block is provided with a corresponding screw, 42, which abuts 25 against the screw 41 when the breech-block is pushed inward into position opposite the bore. These abutting screws are preferably case-hardened, and their ends are in the form of truncated cones, their conical portions projecting beyond the face of the chamber and 30 block, respectively.

An actuating-rod, 43, for moving the breech-block extends through a hole in the body of the gun at the outer end of the breech-block 35 chamber, and the inner end of said rod is screwed into a socket in the breech-block, a check-nut, 44, being fitted at the upper end of said socket. This rod is provided at its outer end with a handle, 45, which is preferably 40 hinged to the rod, so as to fold against the side of the gun. The space around the rod may be closed by a conical split thimble, 46, having an external screw-thread, which takes into a screw-thread at the outer end of the hole for 45 the actuating-rod. This thimble, on being turned inward, closes tightly around the actuating-rod, and on being turned outward releases said rod, so that it will slide readily. A split ring, 47, of soft metal, is preferably in- 50 serted in the interior of this split thimble to form a narrow bearing against the rod, the ring being split at a point opposite the solid part of the thimble, so as to break joint with the slit thereof. This split thimble has an 55 actuating-handle, 48, by which it is turned.

The rear portion of the breech-chamber is provided with a screw-thread, which extends inward from the face of the breech a sufficient distance to give proper support to the breech- 60 screw.

A tubular breech-screw, 49, provided with external screw-threads, which take into the screw-threads of the breech-chamber, serves to press and lock the breech-block against its 65 seat for closing the breech. This breech-screw constitutes a tubular set-screw or clamping-thimble, which need not be removed from the

gun in loading, as the charge can be passed through it. The inner end of this tubular breech-screw rests against the rear face of the breech-block near the circumference thereof. 70 The inner end of the breech-screw and the rear face of the breech-block are ground or ground and scraped to form a tight joint. If desired, the inner end of the breech-screw may be pro- 75 vided with a stuffing-box similar to that of the calking-thimble hereinafter described. The breech-screw is preferably tapered slightly on the outer circumference near its inner end, and an annular recess, 50, is formed in the breech- 80 chamber, in which elastic packing-rings 51 are placed, the tapered end of the screw serving to spread those rings as the screw enters. The inner ring may be of metal and the outer one of asbestos, and the metal ring is preferably 85 split to allow it to expand after the manner of the ring shown in Fig. 17. The tubular breech-screw may be seated against the breech-block to lock it by any suitable means. One 90 of the means shown comprises a rack, 52, attached to the outer end of the breech-screw, and a pinion, 53, on a stub-shaft, 54, supported in the face of the breech near the circumference of the gun, said pinion meshing with said rack and being actuated by a hand-lever, 55. 95 This tubular breech-screw is sufficient in guns of ordinary caliber to lock the breech-block and, in connection with the ground joints at the front and rear faces thereof, to close the breech gas-tight without the use of packing or 100 gas checks.

For guns of extraordinary caliber I prefer to use in connection with the tubular breech-screw 48 a tubular auxiliary breech-screw or calking-thimble, 56, having an external screw- 105 thread, which takes into an internal screw-thread in the breech-screw 49. The breech-block is provided on its rear face, near its periphery, with two annular grooves, 57, which form a rib, 58, between them. The inner end of the 110 auxiliary breech-screw is provided with an annular wedge-shaped groove, 59, in which a packing, 60, of soft metal or other suitable material, is inserted. This groove constitutes a stuffing-box, and the rib 57 on the breech-block 115 constitutes a gland, which fits into this stuffing-box. The outer face of the inner screw serves to calk the joint between the outer screw and the breech-block, and the outer lip of the stuffing-box is preferably slit at intervals to 120 permit lateral expansion to facilitate the calking. The calking-thimble is provided with a handle lever, 61, at its outer end for tightening or releasing the screw.

This invention also comprises an automatic 125 gas-check embodied in and forming a part of the breech-block, to which gas-check I make special claim; but this gas check may be dispensed with without departing from other features of the invention. For the purpose of 130 this gas-check the breech-block is provided in its front face, opposite the seat 35 at the inner end of the breech-chamber, with an annular dovetail channel, 62, which channel has a re-



cess, 63, at its bottom, and with angular gas-ports 64, which extend from this recess forward to the front face of the block and open into the bore of the gun. These angular ports  
 5 are formed by boring inward from the face of the block at an angle thereto, and also boring in radially from the periphery of the block to a point meeting the inclined borings. The radial portions of these ports outside their  
 10 connection with the ports 63 are closed by screw-plugs 65. Rings 66, composed of steel, iron, or other hard metal, are disposed in the dovetailed channel, and a ring, 67, of soft metal, is inserted in said channel in front of  
 15 said hard rings. The hard rings have wedge-shaped interlapping faces. When the explosion of the charge takes place, the explosive gas passes through the angular ports 64 and through the recess 63 into the dovetailed chan-  
 20 nel 62, and forces the rings in said channel forward and presses the soft-metal ring therein against the seat 25, surrounding the bore of the gun, thereby tightly closing the joint between said seat and the breech-block. The  
 25 pressure of the gas also tends to spread the wedge-shaped sections of the hard-metal rings within said channel. A ring, 68, which is wedge-shaped in cross section, is inserted in the channel between the hard-metal rings and  
 30 the outer soft-metal ring. This wedge-shaped ring is placed in the channel after the hard-metal rings are disposed therein, and has the effect to spread the copper ring as it is inserted through the narrow mouth of the channel and  
 35 cause it to dovetail itself within the channel.

The invention also comprises an automatic gas-check embodied in and forming a part of the breech-block at the rear face thereof, to which gas-check I make special claim; but  
 40 this gas-check may also be dispensed with without departing from other features of the invention. For the purpose of this gas-check the breech-block is provided near its rear face with an annular chamber, 94, and with an an-  
 45 nular channel, 95, which extends from said chamber to the rear face of the block opposite the inner end of the breech-screw. Within this chamber is a flanged ring, 96, and a spring or a series of springs, 97, composed of rubber  
 50 or steel, are interposed between the flange of said ring and the rear end of the chamber. A packing, 98, of asbestos or other suitable material, is disposed in the channel 95 in rear of the body of said flanged ring, which packing  
 55 is flush with or inside the rear face of the breech-block when in its normal position. Gas-ducts 99, disposed at certain distances apart around the breech-block, extend from the periphery of said block at an angle thereto  
 60 back to the front end of the annular chamber. The operation of this gas check is as follows: Any powder-gas which might possibly pass the joint at the front face of the breech-block into the annular space between said block and  
 65 the wall of the breech-chamber will enter the inclined ducts 99, thence pass into the annular chamber 94 in front of the flanged ring 96

within said chamber, forcing said ring rearward, and thereby pushing the packing 98 tightly against the inner end of the breech-  
 70 screw and preventing the escape of gas past the joint of the breech-screw and breech-block. The spring or springs 97 serve to force forward the flanged ring after the gun has been discharged, and thereby retract the packing  
 75 to its normal position flush with or within the face of the breech-block, the packing being dovetailed into the body of the flanged ring for this purpose. The chamber in the breech-  
 80 block is formed by cutting two annular recesses in the rear face thereof and screwing a flanged nut, 100, into the inner or deeper recess.

The loading device herein described embraces certain features to which I lay special  
 85 claim; but any other loading device may be employed without departure from other features of my invention. As shown, the loading device comprises a bracket, 69, having  
 90 bracket-arms 70 at its inner end, which are supported in eyes 71, attached to the cap 72, which covers the face of the breech. This bracket is provided with bearings for a short shaft, 73, which has a pinion, 74, and an actuating-crank,  
 95 75. A sliding carriage, 76, for conveying the projectile and charge to the bore of the gun, is provided with a rack, 77, which is engaged by the pinion 74. A stop, 78, on the outer end of the rack passes through a longitudinal  
 100 slot in the bracket and comes in contact with the pinion-shaft and arrests the inward movement of the carriage just as the inner end thereof comes close to the seat 35 at the inner end of the breech-chamber. The arc-shaped body of  
 105 the carriage is of the same curve as the bore of the gun, so that the projectile or charge readily slides from the carriage into the bore. The shaft 73 of the pinion 74 is provided with a stiff spiral spring, 79, which causes the shaft  
 110 to rotate in the reverse direction, so that the pinion automatically withdraws the carriage from the gun after the latter is charged. The carriage is provided with a bumper, 79<sup>a</sup>, of rubber, which comes against a stop, 79<sup>b</sup>, of the  
 115 bracket as the carriage is withdrawn.

One or more lubricating-chambers, 80, may be formed in the breech adjacent to the screw-threaded end of the breech-chamber. Each  
 120 of these lubricating-chambers may be bored in from the face of the breech and afterward plugged at their outer ends. Perforations 81 extend from between the threads of the breech-chamber to these lubricating-chambers for supplying oil to the threads, and the outer breech-  
 125 screw is perforated at intervals for the passage of oil to the intermeshing screw-threads of the calking-thimble and breech-screw. These lubricating-chambers are preferably filled with cotton waste or some absorbent of oil, and they may be fed by removal of the plugs  
 130 or, preferably, through feed channels 82, which extend from the lubricating-chambers to the face of the breech. These channels may be provided with oil-cups at their outer ends.



The grinding of the joints at the front and rear faces of the breech-block, in connection with the seat at the inner end of the breech-chamber and the inner end of the tubular breech screw, is effected by placing the breech-block on a shaft or mandrel, 84, which has a screw-threaded portion, 85, for engaging a screw-threaded hole through the center of the breech-block. The mandrel is supported at its inner end in a disk, 86, fitted within the bore of the gun at its outer end in a larger disk, 87, fitted in the breech-chamber. This mandrel is provided at its outer end with a crank, 88, by which it is turned to effect the grinding of the joints. The breech-screw is screwed up sufficiently against the rear face of the breech-block during the grinding operation to press said block against its seat with sufficient force to effect the grinding of the joint between said seat and the front face of the block, and the grinding of the inner end of said screw against the rear face of the block takes place at the same time. When the shaft is withdrawn from the breech-block after the joints are ground, the hole through the center thereof is closed by a screw-threaded plug, 89, which has an angular head, 90, by which it is turned into or withdrawn from the block.

For moving the breech-blocks of very heavy guns the actuating-rod 43 may be provided with a rack in its under side, and a longitudinal shaft, 91, may extend from a point opposite the outer end of the breech-block chamber to the face of the bore. This shaft 91 is provided at or near its inner end with a pinion, 92, which meshes with the rack in the rod 43 and at its outer end with an actuating-crank, 93.

The operation is as follows: The split thimble 46 is turned slightly to relieve the actuating-rod 43 of the breech-block 34, and the breech-block is withdrawn from the bore of the gun into the lateral breech-block chamber 33 by pulling said rod. The projectile is placed upon the carriage 76 and the crank 75 is turned, whereby the carriage is moved inward by the pinion 74 and rack 77 to the bore of the gun, being arrested by stop 78 just before it reaches the bore. The projectile is then pushed from the carriage into the bore, and the carriage, being relieved of the weight of the projectile, is automatically withdrawn from the breech chamber by the pinion 74 and rack 77 under the action of the spring 79, which causes the shaft to rotate in the reverse direction. The charge of powder is then inserted in the same manner and the carriage automatically withdrawn from the gun after the latter is charged. The breech-block is then pushed into position in rear of the bore opposite its seat at the inner end thereof. The actuating-levers 55 and 61 being in the relative positions shown in full lines in Figs. 2 and 3, the lever 61 of the calking-thimble 56 is swung downward into the position indicated by dotted lines in Fig. 2, whereby the

calking-thimble is lightly seated in and against the rear face of the breech-block, the gland of the block entering the stuffing-box of the thimble. The lever 55 of the breech-screw is then pulled up into the position indicated in dotted lines, whereby the tubular breech-screw is turned sufficiently to seat its inner end tightly against the outer face of the breech-block and lock the latter against the seat at the rear of the bore. The soldier in swinging down the lever 61 assumes a bent position, and in returning to an upright position he pulls up the lever 55, so that both levers are actuated by one movement in two motions. In assuming an erect position he can place his foot upon the lever 61 of the calking-thimble, thereby bracing himself and at the same time further tightening said thimble. The conical split thimble 46 is then given a slight turn, which tightly closes the space around the actuating-rod 43.

To open the breech after the gun is discharged, the soldier grasps the breech-screw lever 55, which is in the dotted line position, and swings it down into the full-line position, thereby assuming a bent attitude, and he then grasps the calking-thimble lever 61 and pulls it into its full-line position, assuming thereby an erect attitude. By this one movement in two motions the breech-block is released, and the operation described above is repeated for reloading.

The automatic gas check embodied in the breech-block at the rear face thereof may be substituted for the automatic gas-check described for the front face of the block, the gas-ports 64 extending to the face of the block opposite the bore being substituted for the inclined ducts 99.

I claim—

1. A cannon-body provided with a breech-chamber of larger diameter than the bore, the shoulder at the meeting ends of the bore and breech-chamber being provided with a solid comparatively soft metallic ring, forming a seat for the breech-block, the inner surface of the ring being continuous with the surface of the bore.

2. A cannon-body provided with a lateral breech-block chamber having depressions or cellars in its bottom at its opposite ends.

3. The combination of a cannon-body provided with a breech-block seat at the inner end of the bore and with a breech-chamber provided with internal screw-threads, a breech-block, and a tubular breech-screw engaging said screw-threads for clamping said breech-block, the joints between the breech-block and its seat and between the clamping-screw and breech-block being ground in unison.

4. The combination of a cannon-body provided with a lateral breech-block chamber and a sliding breech-block therein provided with a flat-faced shoe on its lower side, said shoe being tapered at its opposite ends.

5. The combination of a cannon-body provided with a lateral breech-block chamber



having an abutting screw at its inner end and a sliding breech-block in said chamber provided with a corresponding abutting screw.

6. The combination, with a cannon-body provided with a lateral breech-block chamber, of a sliding breech-block within said chamber provided with a shoe on its under side and with an oil-duct extending through said block and shoe for lubricating the shoe.

7. The combination, with a cannon-body provided with a lateral breech-block chamber closed at both ends, of a breech-block sliding within said chamber, and a pull-rod extending laterally through a hole in the body of the gun into said chamber and connected at its inner end to the breech-block.

8. The combination of a cannon-body provided with a lateral breech-block chamber closed at both ends, a sliding breech-block within said chamber, an actuating-rod connected at one end to said breech-block and extending through a screw-threaded hole in said body at one end of said chamber, and a conical split thimble within said hole around said rod, substantially as set forth.

9. The combination of a cannon body provided with a lateral breech-block chamber closed at both ends, a sliding breech-block within said chamber, an actuating-rod connected at one end to said breech-block and extending through a screw-threaded hole in said body at one end of said chamber, and a conical split thimble within said hole around said rod, said thimble being provided with a soft-metal split ring, substantially as set forth.

10. The combination of a cannon-body provided with a breech-block seat at the rear of the bore and with a breech-chamber having internal screw-threads, a breech-block adapted to rest against said seat and provided with a groove on its rear face, a tubular breech-screw within said chamber for locking said block against its seat, and a calking-thimble provided with screw-threads which mesh with internal screw-threads of the breech-screw, the inner end of said calking-thimble resting in said groove of the breech-block.

11. The combination of a cannon-body provided with a breech-block seat in rear of the bore and with a screw-threaded breech-chamber, a breech-block having a gland on its rear face, a tubular breech-screw for locking the breech against its seat, and a screw-threaded calking-thimble provided with an annular stuffing-box at its inner end for receiving said gland.

12. The combination of a cannon-body provided with a breech-block seat at the inner end of the bore and with a screw-threaded breech-chamber, a breech-block, an annular recess in the breech-chamber in the rear of the breech-block, packing-rings within said recess, and a breech-screw, the inner end of said screw being tapered for forming contact with the packing rings.

13. The combination of a cannon body provided with a breech-block seat in rear of the

bore and with a screw-threaded breech-chamber, a breech-block, a breech-screw, a calking-thimble within said breech-screw, and hand-levers on said breech-screw and calking-thimbles disposed at an angle such that the full throw of the calking lever brings the hand of the operator adjacent to the breech-screw lever.

14. A cannon-body provided with a screw-threaded breech-chamber, with an oil-chamber adjacent thereto, and with oil-ducts leading from said oil-chamber to the screw-threads of the breech-chamber, in combination with a breech-screw fitting such breech-chamber, as set forth.

15. A cannon-body provided with a screw-threaded breech-chamber, with an oil-chamber adjacent thereto, with oil-ducts leading from said oil-chamber to the screw-threads of the breech-chamber, and with an oil-duct leading from said oil-chamber to the face of the breech, in combination with a breech-screw seated in such breech-chamber and suitable operating mechanism therefor, as set forth.

16. The combination, with a cannon-body having a breech-block seat, of a breech-block provided in its front face opposite said seat with an annular channel, and with ducts leading from the bottom of said channel to the front face of the block opposite the bore of the gun, metallic packing-rings within said channel, and means for locking said block against its seat.

17. A breech-block for a breech-loading gun provided with an annular channel in its front face near its periphery opposite the breech-block seat, with gas-ducts leading from said channel to the front face of the block opposite the bore of the gun, hard-metal rings disposed in said channel, and a soft-metal ring, also disposed in said channel in front of the hard rings.

18. A breech-block for a breech-loading gun provided with an annular channel in its front face near its periphery opposite the breech-block seat, with gas-ducts leading from said channel to the front face of the block opposite the bore of the gun, hard-metal rings disposed in said channel, and a soft-metal ring, also disposed in said channel in front of the hard rings, said hard-metal rings being wedge-shaped in cross-section.

19. The combination of a cannon-body, a bracket hinged to said body at the breech thereof, a transverse shaft supported on said bracket, a pinion on said shaft, an actuating-crank, also on said shaft, and a sliding carriage on said bracket provided with a rack with which said pinion engages.

20. The combination of a cannon-body, a bracket at the breech thereof, a transverse shaft supported on said bracket, a pinion on said shaft, an actuating-crank, also on said shaft, a sliding carriage on said bracket provided with a rack with which said pinion engages, and a spring on said shaft, which operates to turn the shaft to automatically retract the carriage from the gun.

21. The combination of a cannon-body, a



bracket hinged to said body at the breech thereof, a transverse shaft supported on said bracket, a pinion on said shaft, an actuating-crank, also on said shaft, and a sliding carriage on said bracket provided with a rack which said pinion engages, said carriage having a stop for arresting its movement at the rear end of the bore.

22. The combination of a cannon-body, a bracket hinged to said body at the breech thereof, a transverse shaft supported on said bracket, a pinion on said shaft, an actuating-crank, also on said shaft, and a sliding carriage on said bracket, provided with a rack with which said pinion engages, and a stop at the rear end of said bracket for arresting the outward movement of the carriage.

23. The combination of a cannon-body provided with a lateral breech-block chamber, a laterally-sliding breech-block, a pull-rod connected at its inner end to said breech-block and provided with a rack, and a longitudinal shaft journaled within the body of the gun, provided at its inner end with a pinion which meshes with said rack and at its outer end with an actuating-crank.

24. The combination of a cannon-body provided with a breech-block seat at the rear of the bore and with a breech-chamber having internal screw-threads, a breech-block, a tubular breech-screw within said chamber for locking said block against its seat, and a calking-thimble provided with screw-threads which mesh with internal screw-threads of the breech-screw, the inner end of said calking-thimble resting against the breech-block.

25. The combination of a cannon-body provided with a breech-block seat at the rear of the bore and with a breech-chamber having internal screw-threads, a breech-block provided with a groove on its rear face, a tubular breech-screw within said chamber for locking said block against its seat, and a screw-threaded calking-thimble within the breech-screw, the inner end of said calking-thimble having a split lip which projects into said groove of the breech-block.

26. The combination of a cannon-body provided with a breech-block seat and with a screw-threaded breech-chamber, a breech-block for closing the bore, provided with an annular recess in its rear face and with gas-ducts leading from said recess to the periphery of said block, a gas-check ring within said recess, and a breech-screw for locking said block.

27. A breech-block for a breech-loading gun provided with an annular chamber near its rear face, ducts extending from said chamber to the periphery of the block, an annular channel in the rear face of the block communicating with said chamber, and packing-rings within said channel and chamber.

28. A breech-block for a breech-loading gun provided with an annular chamber near its rear face, ducts extending from said chamber to the periphery of the block, an annular channel in the rear face of the block communicating with said chamber, a flanged packing-ring within said chamber, packing within said channel connected with said flanged ring, and a spring or springs interposed between the flange of said ring and the rear face of said chamber for retracting the packing within the face of the block.

29. The combination of a cannon-body provided with a breech-block seat in rear of the bore, a breech-block for closing said bore, an automatic gas-check at the front face of the breech-block, an automatic gas-check at the rear face of said block, and a breech-screw for locking said block against its seat.

30. The combination of a cannon-body provided with a breech-block seat in rear of the bore and with a screw-threaded breech-chamber, a breech-block, an automatic gas-check at the front face of said breech-block, an automatic gas-check at the rear of said breech-block, a tubular breech-screw for locking the breech-block against its seat, and a screw-threaded calking-thimble within the breech-screw, the inner end of which is seated against the breech-block.

31. The combination of a cannon-body provided with a breech-block seat in rear of the bore and with a screw-threaded breech-chamber, a breech-block for closing the bore, an automatic gas-check at the front face of the breech-block, an automatic gas check at the rear face of the breech-block, said breech-block being provided with an annular gland on its rear face, and a screw-threaded calking-thimble within the breech-screw, provided at its inner end with an annular stuffing-box which fits over said gland.

32. The combination of a cannon-body provided with a breech-block chamber and a breech-block seat at the rear end of the bore, and a breech-block within said chamber, and means for clamping said breech-block to said seat, the front face of said breech-block and the rear face of said seat being ground in unison.

33. The combination of a cannon-body provided with a breech-block seat at the rear end of the bore and with a breech-block chamber having internal screw-threads, and a tubular breech-screw engaging said screw threads for clamping said breech-block against its seat, the rear face of said breech-block and the inner end of said breech-screw being ground in unison.

WILLIAM T. SMITH.

Witnesses:

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