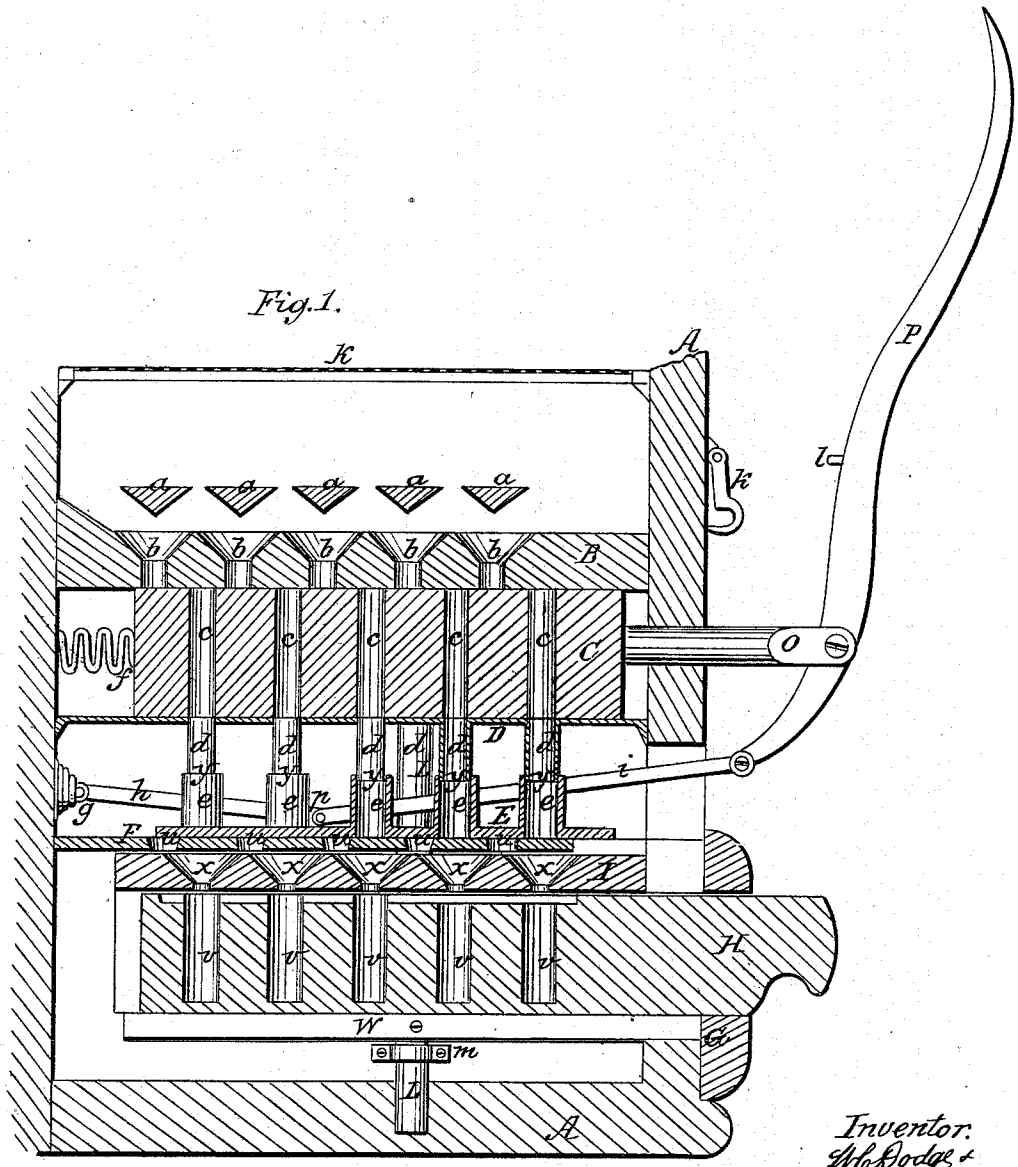
2 Sheets—Sheet 1.

DODGE & SMITH.

Cartridge-filling Machine.

No. 56,489. Patented July 17, 1866.

Fig. 1.



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2 Sheets—Sheet 2.

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Fig. 4.

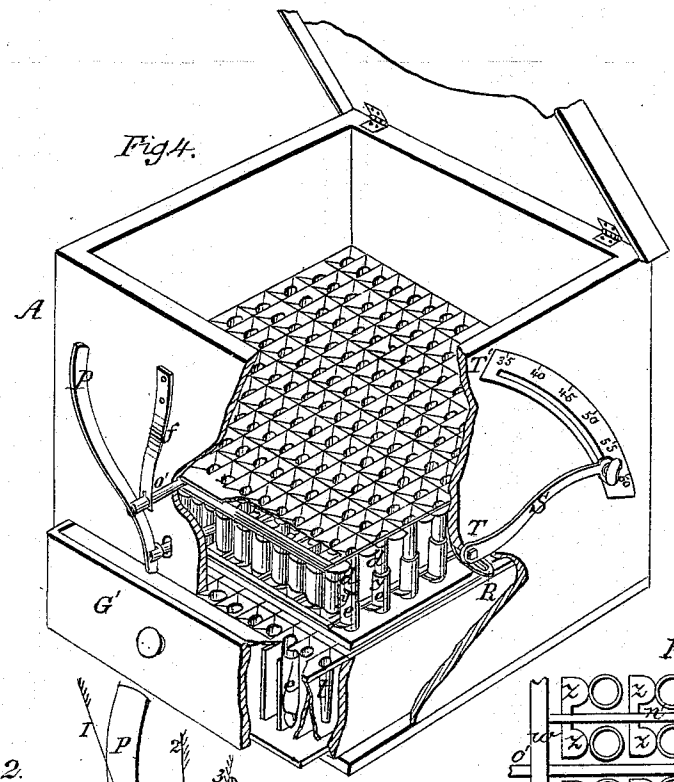

Fig. 6.

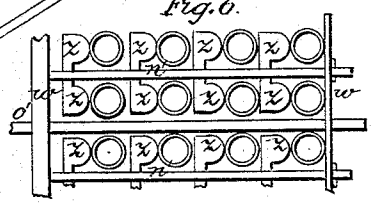

Fig. 2.

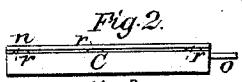

Fig. 3.

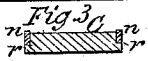

Fig. 7.

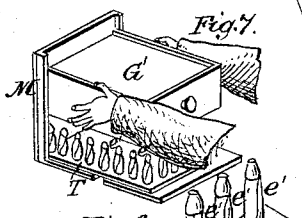

Fig. 8.

Fig. 5.

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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN MACHINES FOR FILLING CARTRIDGES.

Specification forming part of Letters Patent No. **56,489**, dated July 17, 1866.

To all whom it may concern:

Be it known that we, WILLIAM C. DODGE and ROBERT D. O. SMITH, of the city of Washington, in the District of Columbia, have invented certain new and useful Improvements Machines for Filling Cartridge Cases or Shells with Powder; and we do hereby declare that the following is a clear, full, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making part of this specification.

Figure 1 is a vertical section of one style of our machine, and Figs. 2 and 3 are views of one of the slides detached for the purpose of exhibiting the details thereof. Fig. 4 is a perspective view of another style of our improved machine, with a portion broken away for the purpose of exhibiting the internal arrangement. Figs. 5, 6, 7, and 8 are views of detached portions for the purpose of illustrating more clearly its construction and operation.

The object of our invention is fourfold, viz: First, to lessen the danger attending the operation of filling cartridges; second, to save labor and expedite the operation; third, to secure greater accuracy and uniformity in the quantity of powder placed in each cartridge; and, fourth, to indicate and vary or regulate the quantity of powder filled into the cartridges at will.

Our invention consists in providing a box having a hopper for holding the powder and arranging therein a series of slides and tubes for measuring and delivering to the cartridge-cases the required quantity of the same by simply working a lever.

It further consists in providing means for varying or regulating the quantity of powder placed in each cartridge-case and automatically indicating the quantity, and in certain other details hereinafter described.

To enable those skilled in the art to construct and use our invention, we will proceed to describe it.

In Fig. 1, A represents a rectangular box, the upper portion of which constitutes a hopper for the reception of the powder, and which we prefer to make of the proper size to contain one hundred pounds of powder at least, so that when a package of powder is opened it may all be emptied into the hopper at once, when, the cover being closed and secured, the powder is secured from exposure to flying sparks and all similar causes of accidental explosion, whereby the operation is rendered far more safe than when conducted in the usual manner.

K represents a sieve placed within the hopper at any desired height for the purpose of excluding coarse grains or any foreign substances that might choke up the tubes or passages in the slides and hopper-bottom.

Owing to the irregular shape of the grains of powder it is found to be almost impossible to fill cartridges by hand with a uniform quantity, the variation being frequently as great as three grains by weight in an ordinary cartridge It is obvious that this variation in the quantity burned in the gun renders the flight of the ball equally variable, thus in effect destroying to a greater or less extent the accuracy, and consequently the usefulness and reliability, of the arm.

In filling cartridges by hand the powder is dipped from an open trough or box by a cup or measure intended to contain the exact quantity required; but in practice it is found that if in thus dipping it the cup is passed through a larger or smaller mass of powder, or if in "striking" or leveling off the top it happens to be struck against the wire used for that purpose with more or less force, or if the cup happens to be hit against the sides of the box by accident or otherwise—in either or all of these cases the powder is settled or packed more or less, and hence the variation in quantity.

To remedy or obviate these difficulties we provide the following means: First, we perforate the bottom B of the hopper with a series of holes, *b*, for the powder to pass through into the measuring-tubes Y below. It is obvious that if the powder were permitted to flow directly from the hopper into these tubes Y much more would be pressed into them when the hopper was full, or nearly so, than when nearly empty by the weight and pressure of the superincumbent mass of powder. To prevent this we interpose the auxiliary slide

C, having series of holes *c* arranged to correspond with the openings *b* in the hopper-bottom, between said bottom and the measuring-tubes Y, as shown in Fig. 1.

It will be observed that these parts are so arranged that when the holes *c* in slide C are brought directly over the mouths of the tubes Y their communication with the holes *b* in the hopper-bottom is cut off, and consequently the tubes Y will then be filled under the pressure of the powder contained in the holes *c* only. In addition to this we locate directly over the mouth of each row or series of holes *b* in the hopper-bottom a strip or bar, *a*, as shown in Fig. 1 in section. This bar *a* receives most of the pressure of the powder in the hopper, and by being placed over the openings *b* prevents the powder from pressing or running directly down through the said openings into the cells or holes *c* of slide C. In order to reach the cells *c* the powder has to pass down between the bars *a*, from whence it is deflected from its line of movement at an angle of nearly forty-five degrees into the funnel-shaped mouths of the openings *b*, at which point its line of motion is again changed to a vertical direction, thus breaking up and retarding its direct current or line of movement and causing it to enter the cells *c* with great uniformity of motion and pressure. By the combination of these means we deliver the powder to the measuring-tubes Y with an unprecedented degree of uniformity and accuracy, regardless of the amount of powder in the hopper.

For the purpose of regulating the charge delivered to the case, the tube Y, which is the measuring-tube proper, is composed of two separate tubes, *d* and *e*, one sliding within the other telescopically, as shown clearly in Figs. 1 and 4. The upper tubes, *d*, are secured to a plate, D, which is fastened firmly in position, its upper surface forming a support for the slide C, the adjoining faces of said plate and slide being made to fit together with as perfect accuracy as possible. The lower tubes, *e*, are secured to a similar plate, E, which is firmly fastened to two or more rods, L, arranged to move vertically in guides *m*, attached to the sides of the box A.

A shaft, T, (see Figs. 4 and 5,) passes transversely through the box A between the plates D and E, and is provided with a slotted cam, R, near each end, a pin projecting from the rods L or from the edges of plate E working in said slot.

Upon the outside of the box A a lever, *s*, is secured to the end of the shaft T, so that by moving this lever *s* and rotating the shaft T and cams R the plate E, with its tubes *e*, may be raised or lowered as desired, thus varying or regulating at will the quantity of powder which the measuring-tubes Y will contain.

A slotted segmental plate, T′, is secured to the side of the box A in such a position that the end of the lever *s* will sweep over its face when moved for the purpose of adjusting the tubes Y, and on this plate T′ are marked the number of grains that the tubes Y will contain when the end of the lever is set opposite any of said numbers. A thumb-screw is secured in the lever *s* at the proper position for its end to pass through the slot in plate T′ and screw into a nut moving in a recess underneath said plate, by which the lever *s*, which thus constitutes an index, may be secured at any desired point, and at the same time indicating the quantity of powder with which the cartridges will be filled with the machine thus set.

When the tubes Y are adjusted by this arrangement of devices it will be observed that the movement of the plate E, with its tubes *e*, will not be uniform, but will increase in proportion as the cam R assumes or approaches a horizontal position, as illustrated by the well-known case of a crank and pitman united. In such case the graduations on the index-plate T′ must be varied in their distances apart to correspond. To obviate this we propose to use instead of the cams R a small pinion at each end of the shaft T, arranged to gear into cogs cut on the rods L; or, if preferred, a screw-thread may be cut on said rods and a nut placed thereon and held by suitable bearings from moving vertically, these nuts being turned by a screw cut on the shaft T and engaging in teeth on the periphery of said nuts.

When either of these means for adjusting the tubes Y are used the movement of the plate E will be rendered perfectly uniform.

When the pinion is used the end of the lever can be used as an index, and the graduations on the index-plate will be located at equal intervals; but in using the screw and nut it is obvious that the lever or crank attached to the shaft T cannot be thus used, for the reason that the same will require to be rotated several times, in order to give to plate E the necessary movement, and in such case the index or pointer may be attached directly to the plate itself, or to one of the rods, and made to protrude through a slot cut in the side of the box, a graduated plate being used in this case also.

F represents a slide fitted closely to the under side of plate E and attached thereto in such a manner as to rise or fall with said plate E when the latter is moved for the purpose of adjusting the tubes, as before described, but free to move to and fro. This slide F is provided with series of openings *u*, arranged to correspond with the tubes Y.

A lug, *p*, attached to the upper face of slide F, projects through a slot in plate E, and is connected by a rod, *h*, to the spring *g* at one side, and by the rod *i* to the lever P at the other side of the box, the spring *g* serving to keep the slide F drawn back, so as to keep the lower ends of the tubes Y closed, when the lever P is in the position shown in Fig. 1. The lever P is pivoted to the stem O, project-

ing from slide C through the side of box A, the slide C being held forward by spring *f*. These springs *f* and *g* are made of such comparative strength or stiffness that when the lever P has its upper end pressed toward the box A the spring *f* will yield and permit the slide C to be pressed back far enough to bring its cells *c* in line with the openings *b* of the hopper-bottom, as indicated in red lines, when the slide C strikes against a stop and becomes stationary, affording a permanent fulcrum for the time being for lever P, which, continuing its movement, then draws the slide F forward, bringing its holes *u* in line with the bottoms of tubes Y and permitting the powder therein to pass down through the funnel-shaped holes *x* in the plate I, which conduct it into the cartridge-cases *v*, placed underneath to receive it.

When the pressure is removed from the lever P the spring *g*, being strongest operates first, and draws plate F back and closes the bottom of tubes Y, after which spring *f* forces slide C forward, thereby cutting off communication with the hopper above and discharging the powder from its cells *c* into the tubes Y. This operation of the lever P and the slides is more fully illustrated in Fig. 5, which, although representing a simpler form of the machine, has the same movement of the slides. In that figure line 1 represents the normal position of the lever. Line 2 represents the position of the lever when the upper slide is shoved back, and line 3 the position of the lever when the lower slide is drawn forward.

When the machine is constructed as represented in Figs. 4 and 5, without the auxiliary slide C, and the measuring-tubes open direct from the bottom of the hopper, this arrangement of the lever and slides is absolutely necessary, for the reason that if the lower ends of the tubes Y be not closed entirely before their upper ends are opened at all, the powder will flow in a stream direct from the hopper down through the tube Y into the cases below, and thus more than the proper charge will be allowed to pass.

G represents a drawer arranged to slide into the box A directly under the slide F. This drawer G rests upon a frame, W, which is attached to the rods L, as shown in Fig. 1, so that it will always retain its relative position to the plate E and slide F, rising or falling therewith as they may be moved to adjust the tubes Y. The drawer G has a cover, I, permanently attached, provided with series of funnel-shaped holes *x*, as shown in Fig. 1.

H represents a slide of sufficient thickness to have holes bored therein deep enough to receive the cartridge-cases *v*, which are arranged in series corresponding with the holes *x*, the lower ends of said holes being of less diameter than the cases *v*, which stand with their open ends directly under said holes, so as to receive the powder therefrom, the cases here shown being such as are used in breech-loading guns and in which the powder is placed first, the bullet being inserted afterward.

In order to prevent the powder from being caught and crushed between the edges of the cells *c* and openings *b*, the slide C is provided around its upper edges with a slightly-raised rim or projection, *n*, as shown more clearly in section in Fig. 3. By this arrangement a space equal to the thickness of a grain of powder is left between the upper face of slide C and the lower side of the hopper-bottom B, whereby the grains are prevented from being caught and crushed between the edges of the cells *c* and openings *b*. By this means, also, the friction between slide C and the hopper-bottom B is confined to the raised rim *n* alone, instead of extending over the whole surface of the two parts. In order to compensate for the wear of these parts, and for their swelling or shrinking if constructed of wood, this raised rim *n* is made separate from the body of the slide C and fitted in a recess formed around the edges thereof, as shown in Figs. 2 and 3, and rests upon springs *r*, which keep the rim in close contact with the under side of B at all times.

In case the machine is to be used for filling only the style of cartridges shown in Fig. 1, the drawer G may be dispensed with and the slide H, with the cases *v*, be placed directly under and next to the slide F, said slide F being made thicker in that case, so as to give the openings *u* the necessary taper to insure the powder entering the cases *v*. In order, however, to adapt the machine to filling cartridges for muzzle-loading guns also, and which cartridges usually have the balls attached prior to the filling in of the powder, the opening in the box must be of sufficient size to receive a drawer containing this latter style of cases, which are considerably longer than the others; and as the most convenient manner of filling up the surplus space, the drawer G is provided, it being the same depth as that used with the muzzle-loading style of cartridge, the slide H being inserted near the upper side of the drawer G, so as to bring the mouths of the cases *v* close under the holes *x*.

When the machine is to be used for filling the long cartridges the top I′ of the drawer G′ is made removable, and is provided with a series of tubes, *t t*, as shown in Figs. 5, 7, and 8. The drawer G′ is divided by partitions *y* and *y′*, which cross each other at right angles into a series of cells of proper size to receive the cartridge-cases, as shown in Fig. 5.

The cover I′, provided with its tubes *t*, is placed upside down, as shown in Figs. 7 and 8, and the cases *e′* placed thereon as the bullets are fastened to them. When the cover I′ has been thus filled with cases it is placed on the frame M, and the drawer G′, being turned bottom up, is placed over it, the frame M serving to guide the drawer in its descent, so as to insure the tubes *t*, with the cases *e′*, entering the cells in the drawer, as shown in Fig. 5. When thus arranged the drawer G′ is turned right-side up and inserted in the lower portion of the box A, and the lever P being operated the cases are charged, after which the drawer is

withdrawn and the cover I′ is removed, leaving the filled cases *e′* standing in the cells ready to be "choked" or covered up and stored away in the drawers, as may be desired.

If desired, the tubes *t* may be used with the other style of cartridges also; but in practice it is not found necessary, and the operation is more rapid and simple without.

By making the cases *e′* of uniform length and diameter they may be filled without the use of the tubes *t*, the same as the cases *v*; but as usually constructed they are not sufficiently uniform to insure perfect success.

It is obvious that metallic cases can be substituted in the place of the linen cases *v*, and filled in the same manner.

Figs. 4, 5, and 6 represent a modification of our improved machine without the bars *a* and the auxiliary slide C. In this case the measuring-tubes Y are located directly under the hopper-bottom. Instead of the slides C and F, a series of independent slides *z* (shown in Fig. 6 in plan) are used, the tubes Y having a horizontal slot cut in them half-way across the tube to permit the slide *z* to enter and close the tube. These slides or valves *z* are arranged in pairs and attached to rods *w′*, which pass between the tubes Y, and are connected at front and rear by cross-bars *w*, so that all are united and can be moved simultaneously by the rod *o′*, which is connected to the lever P, as shown in Fig. 5. A similar series of slides work through openings in the tubes Y, near their lower ends, and are operated by the rod *i′*, attached to the lower end of lever P. The tubes Y are constructed the same in this as in the former case. This form of the machine is only intended for use where very coarse powder is used and where great accuracy is not required.

It is obvious that a machine constructed and operating on the same general plan may be used for filling cartridges for artillery also, a much less number of tubes, however, being necessary.

If desired, the slide H may be so arranged that it can be shoved through an opening in the back side of the box A by simply shoving another in at the front with a fresh supply of cases; but if that be done some means—such as a spring-catch or some similar device—must be provided to insure the stopping of the slide at the exact position required to bring the mouths of the cartridge-cases under the openings *x*, so as to insure the entry of the powder therein without spilling.

The only limit to the number of cases that can be filled at a single operation is the size of the tray that can be handled with convenience. When cases with the balls attached are to be filled, one hundred tubes will be as many as can be used to advantage, and with such a machine a quarter of a million of cases can be filled in a single day. When the style of cases shown in Fig. 1 is to be filled, four hundred can be handled in a single slide with ease and filled at one movement of the lever, and as in that case the slides require only to be inserted and withdrawn without reversing the drawer, six slides full can be filled per minute, making the enormous quantity of nearly a million and a half in ten hours.

All that is required to perform the operation is to fill the hopper with powder, insert the slide with the cases in, and press the lever.

It will be understood that the cases will be placed in the slides or on the tubes *t* (if that style be used) when made (a requisite number of the slides H or covers I′ being provided with each machine) by the persons forming the cases as they are made, thus saving any extra labor or handling in preparing them for the machine.

It will, of course, be understood that if metal be used in the construction of the machine, it must be of brass or such other kind as will not ignite the powder by its friction.

Having thus fully described our invention, what we claim is—

1. A machine for filling cartridges in which the powder is entirely inclosed during the operation.

2. A series of measuring-tubes so arranged that they can be adjusted to contain a greater or less quantity at will, substantially as described.

3. The combination and arrangement of the lever P, for operating the slides, with springs of different tension for causing the slides to operate alternately with a single movement of the lever, substantially as and for the purpose set forth.

4. The auxiliary charger C, arranged in relation to the hopper-bottom B and the tubes Y, and operating in connection therewith, substantially as described.

5. The bars *a* or their equivalents, arranged over the openings *b* of the hopper-bottom, substantially as and for the purpose set forth.

6. Providing the slide C with the raised rim *n*, with or without the springs *r*, as shown and described.

7. The combination of adjusting devices for regulating the charge with the index-lever *s* and graduated plate T′, as and for the purpose set forth.

8. The slides H, provided with cells for receiving the cartridge-cases, substantially as described.

9. The drawer G′, in combination with the cover I′, provided with the tubes *t*, arranged to operate as and for the purpose set forth.

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