(No Model.) 2 Sheets—Sheet 1.

S. DAVEY & J. WATSON.

MACHINE FOR MAKING COMPRESSED POWDER CARTRIDGES.

No. 303,267. Patented Aug. 12, 1884.

Fig. 1.

Section on C.D.

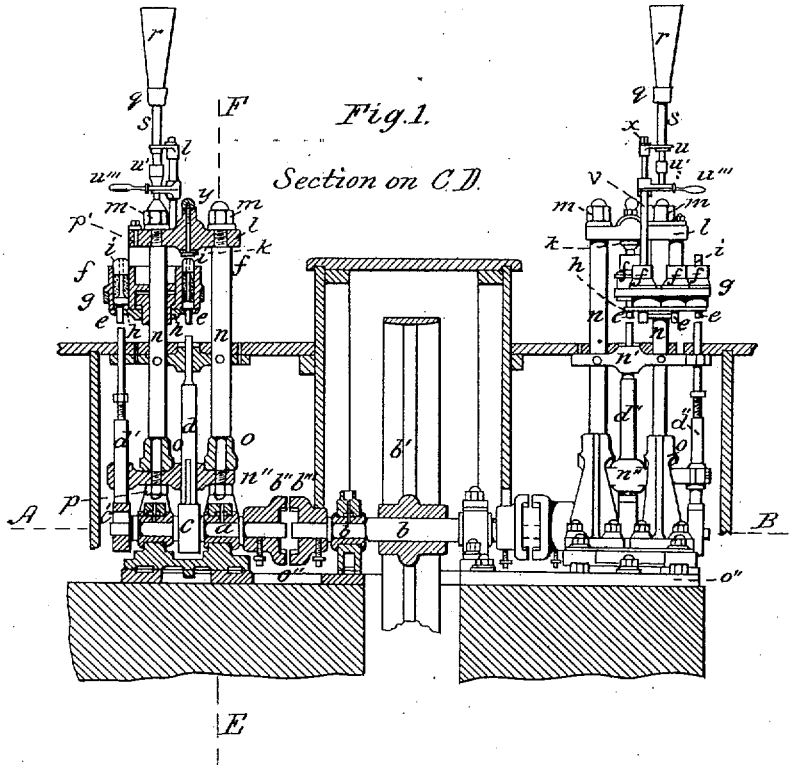

Fig. 2.

Section on A.B.

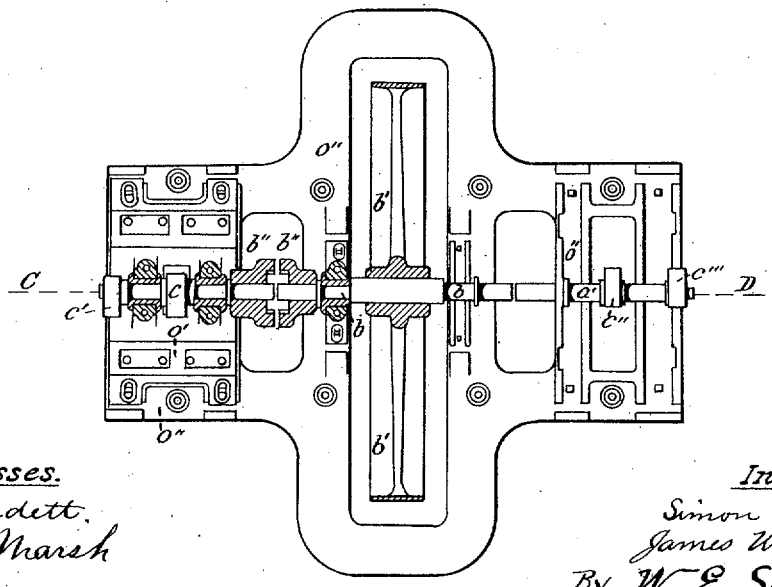

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Fig. 3.

Section on E F.

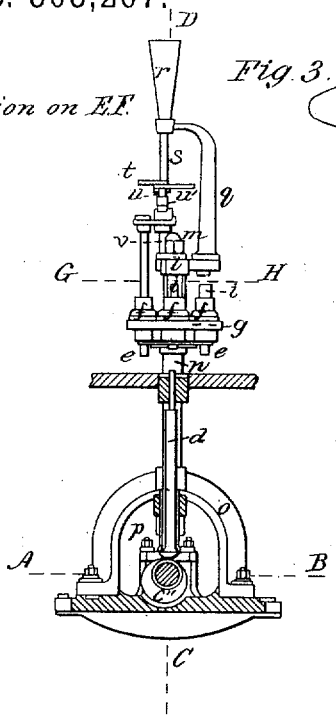


Fig. 5.

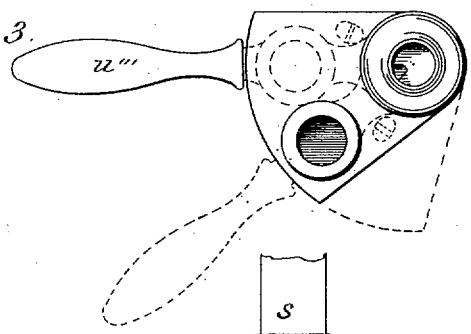


Fig. 6.

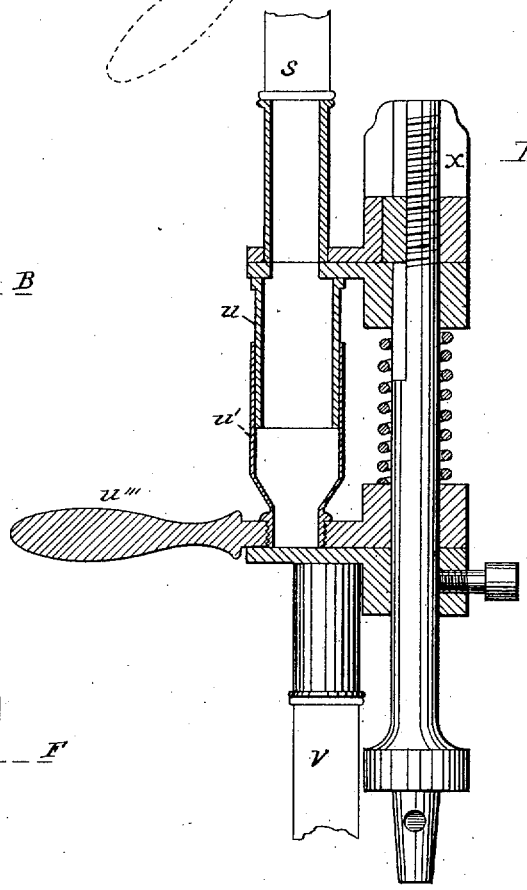
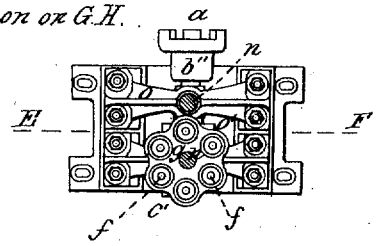


Fig. 4.

Section on G H.



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UNITED STATES PATENT OFFICE.

SIMON DAVEY AND JAMES WATSON, OF ROUEN, FRANCE, ASSIGNORS TO TOY, BICKFORD & COMPANY, OF SIMSBURY, CONNECTICUT.

MACHINE FOR MAKING COMPRESSED-POWDER CARTRIDGES.

SPECIFICATION forming part of Letters Patent No. 303,267, dated August 12, 1884.

Application filed December 13, 1880. (No model.) Patented in Belgium June 24, 1874, No. 34,913; in France June 25, 1874, No. 104,043; in England July 29, 1874, No. 2,641; in Italy August 14, 1874, XI, 7,279; in Sweden February 11, 1875; in Norway April 2, 1875, and in Spain September 13, 1876.

To all whom it may concern:

Be it known that we, SIMON DAVEY and JAMES WATSON, of Rouen, in the department of the Seine-Inférieure, in France, have invented certain Improvements in Machinery for Compressing Cartridges of Grain-Powder or other Explosive Compounds, of which the following is a description, reference being had to the accompanying drawings, where—

Figure 1 is a view of a machine for making cartridges in accordance with our invention in central vertical section on the plane C D. Fig. 2 is a view of the same from above in horizontal cross-section on the plane A B. Fig. 3 is a view of the same in vertical section on the plane E F. Fig. 4 is a view of same in horizontal section from above on plane G H. Fig. 5 is a top view of the telescopic measurer, its right limit of position being shown in dotted lines. Fig. 6 is a central vertical sectional view of the telescopic measurer and its adjusting means.

Our present invention relates particularly to certain improvements in machines for compressing powder in the formation of cartridges; and our invention consists in the details of construction hereinafter fully described and specifically claimed.

The simplified and improved machines which we employ for the compression of the cartridges are shown in the accompanying drawings at Figs. 1, 2, 3, and 4. Upon a shaft, *a*, are two eccentric cams, *c c'*, one of which, *c*, is intended to give an ascending movement to a rod, *d*, which produces the compression of the powder in the molds *f*, which are successively presented to it. The eccentricity of the cam *c* is such that the ascending movement of the rod *d* is very rapid at first, but becomes gradually slower until it is very slow at the last part of its course, thus proportioning the degree of force exerted by the cam *c* to the degree of resistance offered by the charge under pressure, which becomes greater as the compression becomes more complete. Six molds, *f*, are carried by an hexagonal frame, *g*, which turns freely around a strong rod, *n*. At the interior of each mold *f* is a lower piston, *e*, and a plug, *i*, at the top. For cartridges with a central hole the lower piston or plug is prolonged through a central hole in the plug *i*. The plug *i* is held by a plate, *k*, above. This plate can be mounted or dismounted at will by means of a screwed rod governed by a nut, *y*, above the strong cross-piece *l*. This cross-piece is held in its turn by nuts *m m* upon rods *n n* which traverse the arcs *o*. These arcs are connected by strong bolts to a bearing, *o'*, which is itself solidly bolted to the frame *o''*. The shaft *a* being carried upon pedestals cast upon the socket *o'* the rods *n n* and the arcs *o o* maintain the cross-piece *l* always at the same distance from the shaft *a*, and the rotating movement of the cam *c* by causing the diminution of this distance gives the desired compression upon the pistons held by this cross-piece *l*. By unscrewing the nut *y* and introducing washers between the plate *k* and the cross-piece *l* the distance can still further be diminished and the compression of the charge thus augmented, which result may also be attained by increasing the length of the pistons or the amount of charge to compress. Upon the rods *n n* are the guides *n'' n''* which hold the rods *d d'* in these vertical movements. The cross-piece *n'* is held at the desired height by catches which traverse the rods *n n*, while the guide *n''* is maintained in the arcs *o* by strong nuts *p*. The rod *d'*, which can be lengthened or shortened at will, serves to remove the compressed cartridges from their molds. It receives its movement from the second cam, *c'*, and impels the piston *e* to the top of the molds *f*. The molds *f* are free in the hexagonal frame, so that under the impulse of the rod *d*, which throws the pistons *e* into the charge to be compressed, the latter, by pressing against the front partitions of the mold *f*, lifts the mold itself, which then slides along the plug *i*, as shown in the elevation Fig. 1, when the cam *c''* is at the top of its course. It results therefore that the charge can be compressed at the top as well as at the bottom, (just as if the one set of pistons *i* obeyed a descending movement at the same moment as the piston *e* rose,)

which gives the desired regularity to the compression in the whole charge; but when under the influence of the second cam, c', the rod d' pushes the piston e upward, the mold f is held by an extractor, p', which is connected to the cross-piece l by a nut. The compressed charge is thus expelled from the mold, and is picked up by the workman who has charge of the machine, who puts the piston e in place, ready to receive a fresh charge in the mold. The lower part of the piston e, being of a smaller diameter, traverses a carefully-made hole in the disk h, which is fixed at the desired height upon the frame g. The pistons e only descend to the support presented by their larger diameter in front, and thus close the bottom of the mold-hole into which a fresh charge is led by an india-rubber pipe, v. The plug i is then put in place by the attendant, and the mold thus charged is ready to pass (by a rotating movement imparted to the frame g by the attendant) between the rod d, and the plate k to receive the compression. The charge, which falls through the india-rubber pipe v, is previously measured in the telescopic measurer $u\ u'$, which is moved by the handle u''' to the right or left. When the measure is at the end of its course on one side, its lower orifice communicates with the flexible pipe v, and at the other end of its course its upper orifice communicates through the pipe with a funnel, r, which incloses the powder or other material to be compressed, and is held in place by a curved arm, q, fixed upon a claw cast upon one side of the cross-piece l. Another little claw upon the same cross-piece l holds the rod v', which serves as a support for the measuring apparatus. The upper part, u, of the telescopic measure carries a wing or plate which serves as an obturator to the orifice of the tube s, and a spiral spring around the rod v', which holds the two parts of the telescope at the desired height for an exact measuring, while the nut x allows them to be screwed again together, if necessary. In practice we adjust and use the measuring device to place in a cartridge that amount of powder which will make each cartridge weigh a certain fractional part of a pound, so that the user may know just how much weight of powder he is using without the trouble of weighing it.

The drawings show two machines connected, both receiving the rotating movement necessary for their cams $c\ c'$ and $c''\ c'''$ from a single intermediate shaft, b, which communicates with the shafts $a\ a'$ by the coupling b'' and b'''. The shaft $b\ b$ carries a large fixed pulley, b', to which a band serves to transmit the motive force. In order to equalize the effort required from the motive force the two presses are coupled in such a manner that when the cams $c\ c'$ upon the shaft a rise to perform their work the two cams $c''\ c'''$ upon the other shaft, a', are ready to pass below, and the rods $d''\ d'''$ fall to the bottom of their course by their own weight. In the case when the presses are thus coupled the two cams upon each shaft are habitually upon the same line of the same side of the shaft and exert their efforts (of compression upon one charge and of expulsion upon another charge) at the same time, which is found sufficiently convenient in practice, but when the work is not sufficiently considerable to permit the employment or installation of coupled presses, and when in consequence a machine must always act singly, then, in order to equalize the effort required from the motive power, the compressing-cam can be on one side of the shaft, and the expelling-cam on the opposite one, as shown in elevation in Fig. 1. The compressing-cams $c\ c''$ dip at each revolution into oil contained in a cup arranged for the passage in the bearing o'. The shafts are of the best soft iron. The cams are of steel. The compressing-cam is welded to the same shaft. The expelling one is keyed beneath. The lower parts of the vertical rods which bear upon the cams are also of steel welded to the ends of rods of forged iron.

The rods $n\ n$ and their nuts $p\ p$ are of iron. The cross-piece l, the frame g, the disk h, the molds f, their piston e, and plug i, the plate k, the curved arms q, and the measuring apparatus, are all of bronze. The funnel r is of copper, and the upper parts of the large rods $n\ n$, between the cross-pieces n' and l, are provided with sheaths of copper. The bronze of the molds f, and of the piston e and plug i, is specially made of a very resisting quality. The arc $o\ o$, the sockets o', the frame o'', and the cross-piece $n''\ n''$ are of cast-iron. A screen, which is shown in section at Figs. 1 and 3, boxes in the large pulley and all the moving parts of the two coupled presses. This screen forms a table at the height of the cross-piece n', upon which the cartridges are placed in proportion as the molds are withdrawn, and all the visible parts of the mechanism above this table are, as has just been explained, of bronze or copper, except the two ends of the rods $d\ d'$, which rise through the holes across the table, and are covered by bronze caps. We can preserve the same arrangement of the parts of the mechanism visible above the table, in order to replace the rods actuated by the cams by other rods put in motion by the hydraulic press, which can be applied either by an ordinary hydraulic press or by the action of a reservoir of hydraulic force transmitted by pipes with little pistons of the desired diameter, in order to provide the compressing force necessary at the same time as the vertical movement under the pistons e. In the latter case the opening of the valves necessary to regulate the movements of these hydraulic presses is effected by a mechanical transmission communicating with the motive force.

We can replace the frame of hexagonal form by a frame of straight or curved form sliding upon rails across the table under the cross-piece l; but in ordinary practice we prefer the arrangement formerly described. We can also suppress upon each shaft the second cam, whose

function it is to expel the compressed cartridge from the mold by effecting this service by means of a rod attached to the principal rod, which gives the compression to the charge, and which receives its movement from the first cam. We can put other numbers of molds than those indicated in the frame; but we prefer the number six, which in the one hand leaves the time desired to recharge the molds after the expulsion of the cartridge and before coming again under the action of the rod which compresses the charge, while, on the other hand, the charge which has just been compressed remaining in the mold during two consecutive movements of the cam becomes consolidated, and does not swell after its expulsion from the mold, as it is liable to do if the expulsion takes place too quickly after the compression.

We can also dispense with the cast-iron arcs *o o* by placing the rods *n n* in front and behind the cam and in the line of its rotating movement; but then the two rods *n n*, while directly connected to the socket *o'*, are also more separated one from the other, and the cross-piece of bronze *l*, which unites them and receives all the effort of the cam, is required to be of larger dimensions.

We can communicate the movement of the shaft *b* by means of gearing-wheels; but we prefer to do so by a strong leather band upon the large pulley *b'*, thus avoiding any risk of accident arising from the powder getting between the teeth of the gearings.

We can also drive each press separately without intermediate shafting. We can employ for the molds any substance other than hard bronze, as well as for the pistons, or else we can provide the rubbing-surfaces with any substance possessing sufficient resistance to the work, and of a nature to diminish the heating effect of the friction upon the powder or other charge to be compressed; but in practice, in compressing powder, we do not find any inconvenience from the hard bronze.

We can, for measuring the charge, replace the movable telescopic chamber *u u'* by a movable chamber of which the area can be augmented or reduced at will either by a movable partition, or by an elastic partition, or by an elastic fitting actuated by a screw.

We desire to reserve to ourselves the power of modifying the form or the surfaces of the pistons or molds, especially so as to produce cartridges with vertical grooves on one side and with inclined grooves at the lower part.

We can construct the machines with the shaft carrying the cam above the molding apparatus instead of being below, as we can construct them with two shafts and double cams, the one above and the other below; but in consequence of its greater simplicity, economy, and safety we prefer the arrangement shown in the drawings, Figs. 1, 2, 3, and 4.

Having now described the nature of our said invention, and the manner in which the same is to be performed, we declare that we claim—

1. In combination, a series of revolving molds with their chambers, each having a piston, *e*, and a plug, *i*, a reciprocating plunger to actuate said piston and plug, a reciprocating ejector to remove the compressed charges from the molds, and a means for holding the plug in place while the charge is being compressed, all constructed to operate substantially as described.

2. In combination, the flexible pipe *v*, charge-measurer *u u'*, with its handle *u'''*, and supporting-rod *v'*, the revolving molds *f*, adapted to slide in the frame *g*, disk *h*, with its hole, the compressing-rod *d*, plate *k*, expelling-rod *d'*, pistons *e*, and plugs *i*, all constructed and arranged to operate substantially as described.

3. The combination of the revolving molds *f*, the compressing-rod *d*, the ejecting-rod *d'*, pistons *e* in the bottoms of the chambers of the molds, plugs *i* in the tops of the chambers, and an adjustable stop on the frame, by which the plugs *i* are held and the degree of compression regulated, substantially as described.

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