May 2, 1939. A. M. SMITH 2,156,822

SORTING MACHINE

Filed Oct. 20, 1936 3 Sheets-Sheet 1

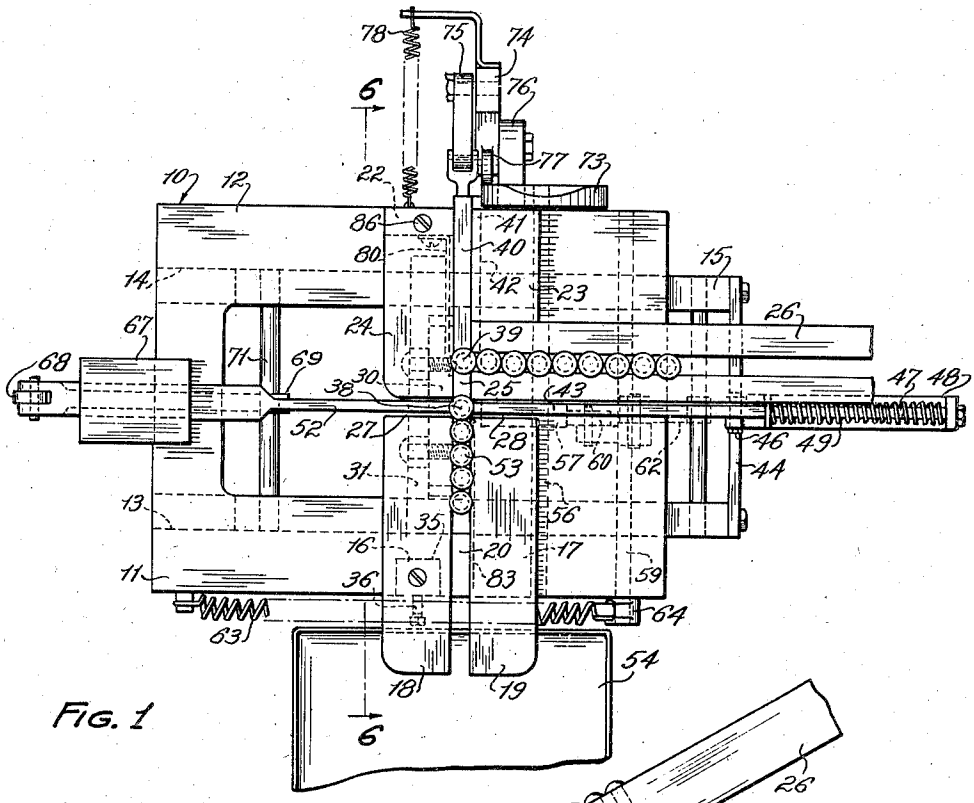


FIG. 1

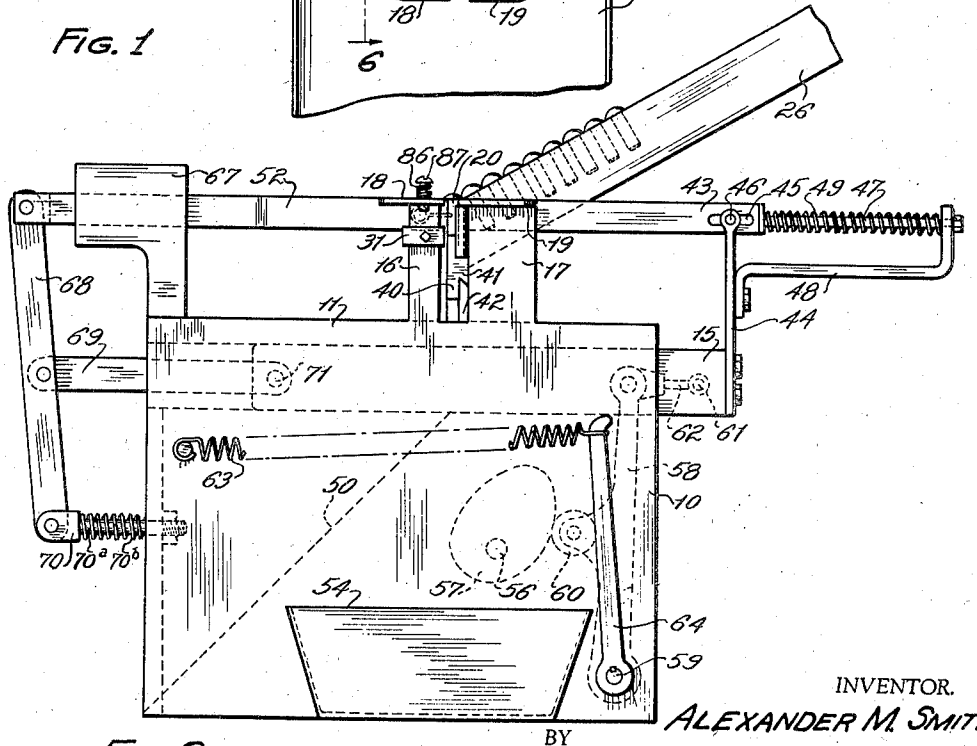


FIG. 2

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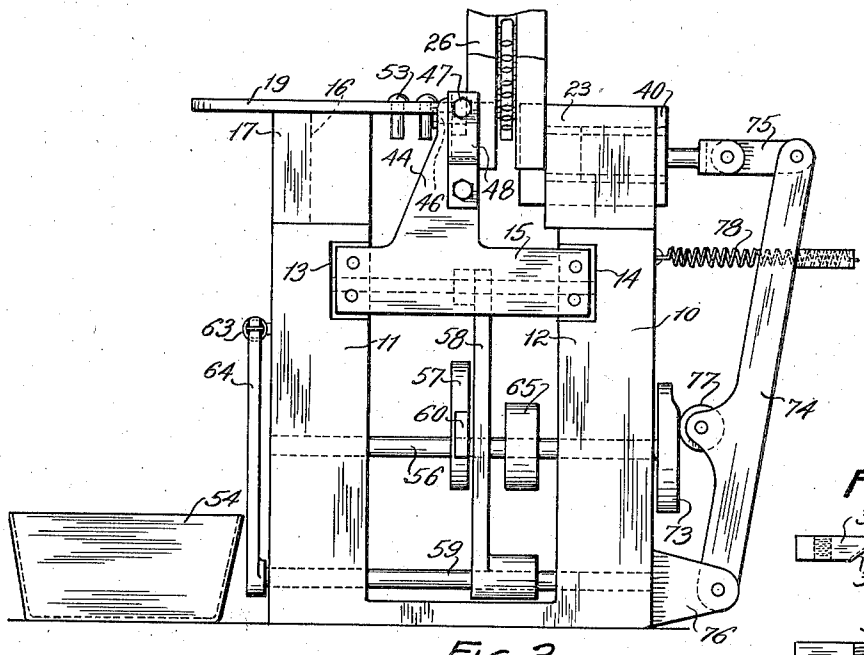


FIG. 3

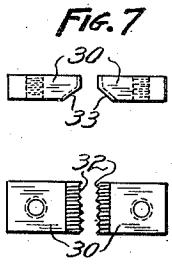


FIG. 7

FIG. 7a

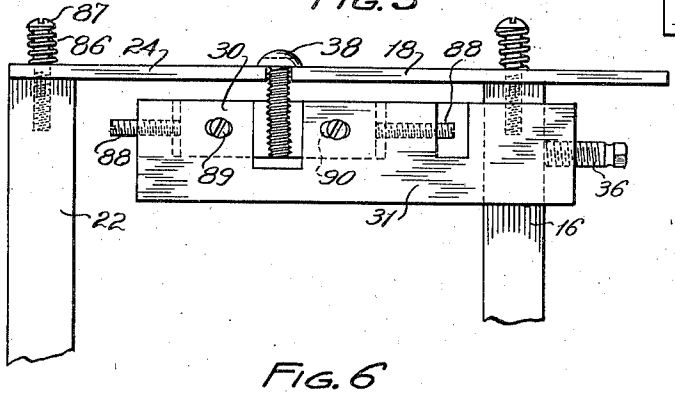


FIG. 6

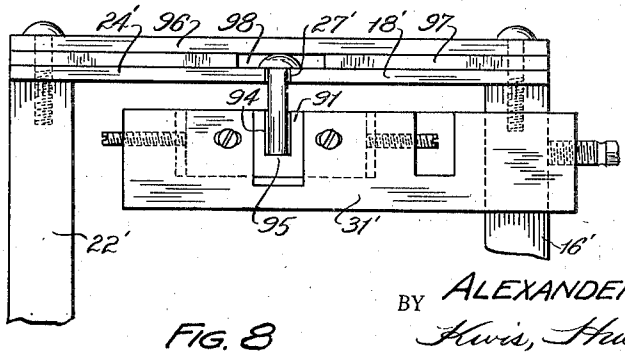


FIG. 8

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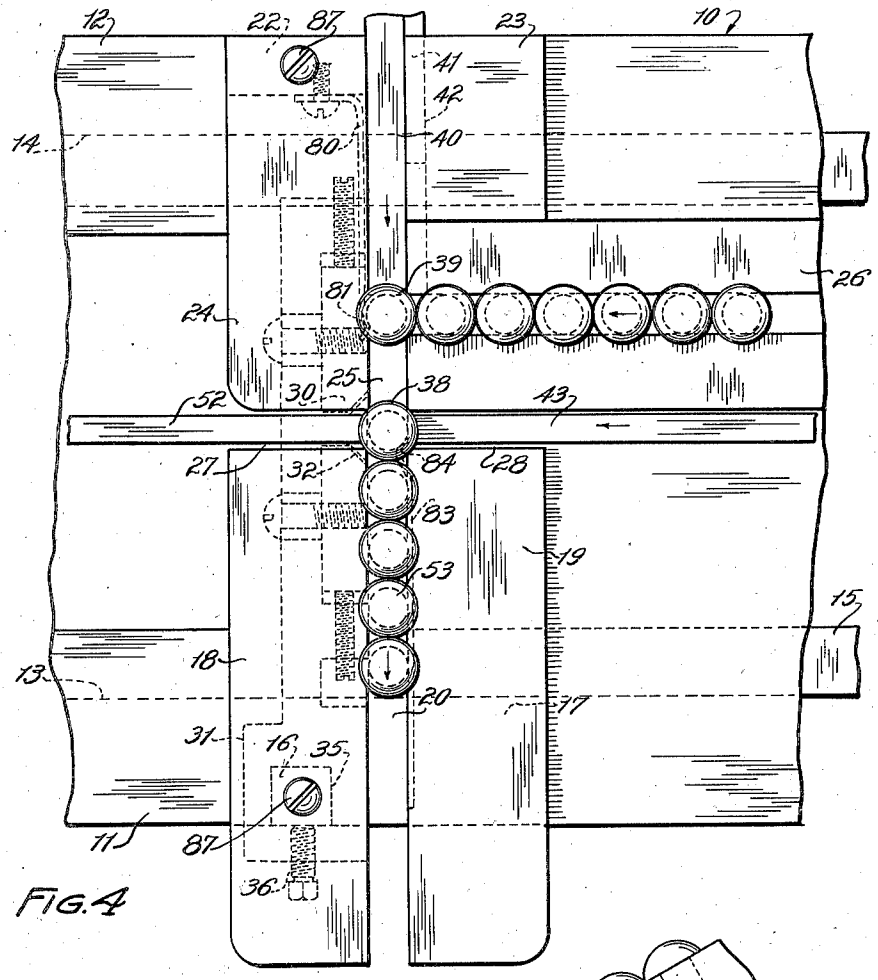


FIG. 4

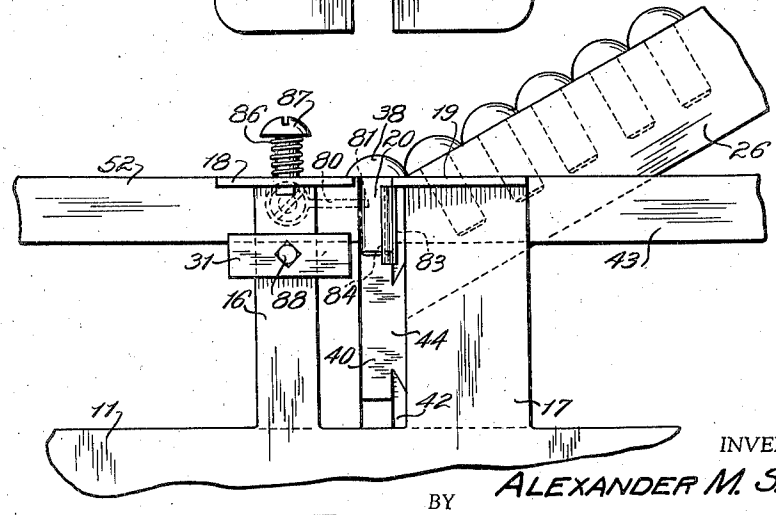


FIG. 5

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UNITED STATES PATENT OFFICE

2,156,822

SORTING MACHINE

Alexander M. Smith, Kent, Ohio, assignor to The Lamson & Sessions Company, Cleveland, Ohio, a corporation of Ohio

Application October 20, 1936, Serial No. 106,606

5 Claims. (Cl. 209—82)

This invention relates to an article sorting machine, and more particularly to an improved machine of this kind adapted to handle bolts or other articles and to select and eject those articles which are oversize or of irregular form.

An object of my invention is to provide an improved sorting machine having a gauge adapted to distinguish between articles of satisfactory and unsatisfactory form and having novel means for feeding articles to the gauge.

Another object of my invention is to provide an improved sorting machine adapted to handle bolts and other articles and having a gauge adapted to permit passage of articles of satisfactory form and to temporarily retain articles of oversize or irregular form, and also having novel article feeding means including means for ejecting the unsatisfactory articles from the gauge.

Still another object of my invention is to provide an improved article sorting machine, of the type mentioned, having a gauge adapted to permit passage of articles of satisfactory form and to temporarily retain articles of unsatisfactory form, and wherein the means for feeding the articles includes a pair of plungers, one of which moves individual articles to the gauge in succession and the other of which ejects the unsatisfactory articles from the gauge.

A further object of my invention is to provide a sorting machine, of the type referred to, having a gauge and novel means for presenting individual articles in succession to the gauge and ejecting unsatisfactory articles therefrom, and wherein means operating to feed the individual articles into position to be presented to the gauge causes a previously ejected article of unsatisfactory form to be displaced from such position.

Other objects and advantages of my invention will be apparent from the following description when taken in conjunction with the accompanying sheets of drawings, in which

Fig. 1 is a plan view of a sorting machine embodying my invention.

Fig. 2 is a side elevation thereof.

Fig. 3 is an end elevation of the machine.

Fig. 4 is a partial plan view of the machine showing the article feeding means on a larger scale.

Fig. 5 is a partial side elevation of the machine showing the article feeding means on a larger scale.

Fig. 6 is a partial end elevation looking in the direction indicated by the line 6—6 of Fig. 1 and showing the gauge in elevation.

Fig. 7 is a detached view showing a pair of gauge elements in plan.

Fig. 7a is a detached view showing the pair of gauge elements in elevation, and

Fig. 8 is a partial end view similar to that of Fig. 6 but illustrating another form of gauge.

In the accompanying drawings, to which more detailed reference will now be made, I have shown an article sorting machine in which individual articles are presented to a gauge in succession and the oversize or irregular articles are sorted out and ejected. The particular sorting machine illustrated in this instance is adapted for the handling of bolts and, therefore, in describing my invention specific reference is made to bolts as the articles being sorted, but it should be understood that the invention is adaptable to the handling of numerous other articles and may be embodied in various other forms of machines.

The machine illustrated in the drawings is provided with a hollow frame 10 which forms a support for the gauge and for the article handling or feeding mechanism. The frame may have laterally spaced uprights 11 and 12 of which the adjacent faces are provided with opposed grooves forming ways 13 and 14. A reciprocable slide 15 operates in these ways and forms a part of the article feeding or handling mechanism which is to be presently described.

The frame upright 11 is provided adjacent the top thereof with post-like extensions 16 and 17 upon which plates 18 and 19 are mounted, respectively. These plates have their adjacent edges in substantially parallel relation defining a guideway or passage 20 for the stems of the bolts being handled. Similarly, the frame upright 12 has upwardly extending post-like extensions 22 and 23, and a plate 24 mounted on the extension 22 is disposed in substantially aligned relation with the plate 18. One edge of the plate 24 defines one wall of an article feeding passage 25 which is aligned with the passage 20. The other side of the passage 25 is formed in part by the lower end of an article feeding galley or magazine 26 and in part by the upwardly extending frame projection 23.

As shown in Figs. 1 and 4, the adjacent ends of the plates 18 and 24 are spaced apart to provide a channel or guideway 27 which intersects the guideway 20, 25 at substantially right angles. Similarly, the inner end of the plate 19 is spaced from the lower end of the magazine 26 to provide a guideway 28 which also intersects the guideway 20, 25 and is aligned with the guideway 27. Thus the plates 18, 19, 23 and 24 form a table having

the article guiding slots or passages 20, 25, 27 and 28 therein.

The magazine 26 may be formed by a pair of bars spaced apart laterally a distance such that the stems of the bolts to be sorted are freely movable therebetween while the heads of the bolts rest upon the upper edges of the bars. The magazine may be inclined as shown in Figs. 2 and 5 so that the bolts will travel downwardly therein under the influence of gravity. The magazine passage communicates at its lower end with the guideway 25 so that articles will be fed individually from the magazine to the latter passage.

A gauge of the desired form may be mounted on the frame in laterally offset relation to the magazine 26 and in position to receive individual articles which are moved along a path defined by the guideways 27, 28. In this instance the gauge comprises a pair of gauge elements 30 which are adjustably mounted in a gauge block 31. When the bolts to be sorted have threaded stems, as in this instance, the adjacent ends of the gauge elements 30 are provided with teeth 32 which are of a cross-sectional shape and pitch corresponding with the character and pitch of the thread to be gauged. The adjacent ends of these gauge element are preferably beveled as indicated at 33, and the teeth 32 extend at least part-way across the beveled faces. When the gauge is in its operating position the beveled faces 33 are presented toward the article feeding passages so that when the threaded bolt stems are presented to the gauge the thread grooves will more readily mesh with the teeth of the gauge elements.

The gauge block 31 may be mounted on the post extension 16 of the frame and, for this purpose, may be provided with an opening 35 which receives the post and permits sliding of the gauge block vertically therealong. When the gauge block has been adjusted vertically relative to the plates 18 and 24 to bring the gauge elements to the desired position, a set screw 36 may be tightened against the post extension 16 to retain the gauge in the desired adjustment.

The bolts are transferred or fed individually in succession along the passage 25 from the lower end of the magazine 26 to a position directly opposite the gauge or, in other words, are moved individually from the lower end of the magazine to the point of intersection of the aligned passages 27, 28 with the aligned passages 20, 25. In Figs. 1 and 4 of the drawings I show a bolt 38 at this point of intersection and in position directly opposite the gauge preparatory to being fed thereto. I also show a bolt 39 in the passage 25, just after having moved into this passage from the lower end of the magazine, and ready to be moved to the position of the bolt 38 on the next operation of the machine.

For transferring bolts from the position of the bolt 39 to the position of the bolt 38 I provide a reciprocable article feeding plunger 40 which operates in the passage 25, that is to say, in the space between the plate 24 on one hand and the frame extension 23 and the galley 26 on the other. The plunger 40 may have a portion 41 of dovetail shape which operates in a similarly shaped guideway 42 of the extension 23.

For moving the individual bolts from the position of the bolt 38 into the opening or passage of the gauge I provide a plunger 43 which is reciprocably movable in the passage or guideway 28. The plunger 43 is supported by the slide 15 and is operated by the reciprocating movements of the latter. The plunger is carried by a plate-like bracket 44 forming a part of the slide but is so mounted on the bracket as to permit of relative movement between the slide and the plunger. For this purpose the outer end of the plunger 43 is provided with a slot 45, see Fig. 2, in which a laterally extending pin 46 of the bracket 44 supportingly engages. The outer end of the plunger 43 is also provided with a rod-like extension 47 which extends through and is slidable in an opening of an arm 48 of the bracket 44. A coiled compression spring 49 is disposed around the rod 47 between the outer end of the plunger 43 and the outer end of the arm 48. When the slide 15 moves toward the left, as seen in Figs. 1 and 2, motion is transmitted to the plunger 43 through the spring 49 to cause the plunger to move in the same direction and advance the bolt 38 along the guideway 27 to the gauge.

Before proceeding further with the description of the bolt handling mechanism it should be explained that the gauge elements 30 are spaced apart a distance such that bolts which are of a predetermined diameter or which have threads of proper form and pitch cut thereon will pass through the opening between the adjacent ends of the elements. If the bolt stem is of oversize diameter or if the threads thereon are not of proper pitch and form, the bolt will not pass through the gauge opening, but will be temporarily retained therein. When such a bolt of unsatisfactory characteristic is moved to the gauge from the position of the bolt 38 by the plunger 43, the bolt jams against the gauge elements or in the gauge opening and the plunger 43 comes to a stop before it has completed its full travel. When this condition occurs the slide 15 continues to move to the left after the jamming of the unsatisfactory bolt in the gauge but yielding of the spring 49 prevents damage to the gauge and other parts of the apparatus. If the bolt is satisfactory the plunger 43 pushes it on through the gauge opening and, when the bolt is free of the gauge, it drops onto the inclined face 50 of the frame and is directed thereby downwardly into a pile adjacent the machine or into a container disposed to receive the same.

As just explained, bolts of oversize or irregular form are temporarily retained in the gauge and, for the purpose of ejecting these unsatisfactory bolts I provide a plunger 52 which is aligned with the plunger 43 and is movable conjointly therewith. The plunger 52 operates in the passage 27 with its inner end spaced from the inner end of the plunger 43. The faces or shoulders formed by the adjacent ends of these plungers define a pocket-like space into which individual bolts are moved or transferred from the lower end of the magazine 26. The conjoint movement of plungers 52 and 43 causes this pocket or space to move toward the left, as seen in Figs. 1 and 4, to convey the bolt 38 to the gauge opening with the stem of the bolt extending downward into the pocket and the head of the bolt overlying the plunger ends. If the bolt is of satisfactory form it passes through the gauge as just explained above but, if it is of unsatisfactory form, it is temporarily held in the gauge and upon the return movement of the slide 15 the plunger 52 ejects such bolt from the gauge opening. During their return movement the plungers 52 and 43 move conjointly toward the right, as seen in Figs 1 and 4, and the irregular or unsatisfactory bolt is returned from the gauge opening to the position of the bolt 38. The stroke or travel of the plungers 43 and 52 is such that their move-

ment to the left will carry bolts of satisfactory form completely through the gauge opening, and their movement to the right will always bring the pocket defined by the plunger ends into register with the passages 20 and 25. The stroke of the plunger 52 is, however, longer than the stroke of the plunger 43 so that by the time the bolt has been carried through the gauge, the former plunger will have moved away from the latter plunger and thus enlarged the pocket sufficiently to permit the bolt to drop freely therefrom.

After the return movement of the plungers 52 and 43 has brought the pocket into alignment with the passages 20 and 25 the plunger 40 is actuated to advance or feed a bolt from the position of the bolt 39 into the pocket. If the bolt previously advanced to the gauge by the plunger 43 was of satisfactory form and passed through the gauge opening, the pocket will be empty and the bolt being advanced from the magagine will move into the pocket without obstruction. If, however, the bolt previously advanced to the gauge by the plunger 43 was of unsatisfactory form and was returned to the position of the bolt 38 by the plunger 52, the bolt fed from the position of the bolt 39 will engage this returned or rejected bolt and the latter will be pushed out of the pocket and into the passage 26. In Figs. 1 and 4 I show a row of such rejected bolts 53 in the passage 20 and after this passage becomes full the rejected bolts will drop one by one off the outer ends of the plates 18 and 19 and into a container 54 disposed therebeneath.

The slide 15 is operable in the ways 13 and 14 of the frame 10, as explained above, and reciprocating movement may be imparted thereto in any suitable way to cause the desired reciprocation of the plungers 43 and 52. In this instance I show a transverse shaft 56 mounted in the frame and having a cam 57 thereon between the uprights 11 and 12. A lever 58 having one end thereof keyed to a transverse pivot or rock shaft 59 of the frame, carries a roller 60 which engages the cam 57 as a cam follower. The free or outer end of the lever 58 is connected with a transverse pivot shaft 61 of the slide 15 by means of a link 62. A tension spring 63 acting on an arm or lever 64 of the pivot shaft 59 normally urges the lever 58 in a direction to press the cam follower 60 against its cam and to shift the slide 15, and the plungers 43 and 52 connected therewith, toward the left. The shaft 56 may be driven from any suitable source of power, such as an electric motor, and the torque may be transmitted thereto through suitable means such as a belt engaging a pulley 65 mounted on the shaft. During the rotation of the shaft 56 the cam 57 acting on the roller of the lever 58 causes the slide 15 and the plungers 43 and 52 to be shifted toward the right and the tension spring 63 acting on the shaft 59 through the lever 64 causes the slide and the plungers to be moved in the opposite direction, that is toward the left, so that during rotation of this shaft a rapid continuous reciprocation of the slide and plungers results.

Reverting to the plunger 52 which ejects unsatisfactory bolts from the gauge, it should be explained that this plunger may be mounted on the frame by being slidably supported in the elongated bearing 67. The plunger may extend through the bearing and its outer end may be connected with the slide 15 by means of the lever 68 and the link 69. The lever 68 preferably has the lower end thereof fulcrumed on the frame by means of the bracket 70, and the link 69 has one end thereof connected with the lever at an intermediate point and its other end connected with the slide by means of a transverse pivot shaft 71. The bracket 70 may be connected with the frame 10 by means of a stem portion 70a which is slidable in an opening of the frame. A compression spring 70b normally holds the bracket 70 in its extended position as shown in Fig. 2 but will yield and prevent breakage of the apparatus in the event that a jam occurs between the gauge and the plunger 52 and prevents return movement of the latter.

It is desirable to have the plunger 40 operated in timed relation to the operation of the plungers 43 and 52 and, to this end, I provide a cam 73 on the outer end of the shaft 56, and actuate the plunger 40 by movement transmitted from this cam. As best illustrated in Fig. 3 of the drawings, motion may be transmitted to the plunger 40 by a swinging lever 74 and a connecting link 75. The lever 74 has one end thereof fulcrumed on a lug 76 of the frame and at an intermediate point may carry a cam follower in the form of a roller 77 which engages the cam 73. The link 75 pivotally connects the other end of the lever 74 with the plunger 40.

Rotary movement of the cam 73 causes the lever 74 to be swung first in a direction away from the frame 10 to thereby impart retracting movement to the plunger 40 and to extend a tension spring 78. Further rotary movement of the cam 73 permits the tension spring 78 to swing the lever 74 toward the frame and thereby move the plunger 40 in a direction to advance a bolt from the position of the bolt 39 to the position of the bolt 38.

From the construction and operation of the bolt feeding and handling mechanism and thus far described, it will be seen that the force which actuates the plunger 40 to feed a bolt to the position of the bolt 38 is determined by the characteristics of the spring 78. Similarly the characteristics of the springs 49 and 63 determine the force which is applied to individual bolts being fed to the gauge. Also, the spring 70b prevents excessive force from acting on the plunger 52 if a jam occurs during its return movement. Thus if a jam occurs one or all of these springs will yield and damage or breakage will be prevented even though the machine continues to run after the jam occurs.

In the operation of a sorting machine of this type I find it desirable to provide for accurately locating individual bolts at the stations represented by the bolts 38 and 39. If this is done the tendency for bolts to become tilted or jammed during the operation of the feeding mechanism is substantially eliminated. For thus positioning the bolt 39 I provide an elongated wire spring 80 which is disposed beneath the plate 24 and lies adjacent the passage in which the plunger 40 operates. The outer end of this spring may be anchored to the post 22 and its inner end is provided with an offset portion 81 which extends into the passage 25 and engages each bolt that moves into the latter passage from the magazine 26. This spring holds the bolt upright in the position of the bolt 39 until it is to be advanced by the plunger 40 whereupon the bolt is pushed out of engagement with the spring.

Similarly, I provide an elongated flat spring 83 for locating the bolts at the position represented by the bolt 38. The spring 83 is disposed below

the plate 19 and lies at one side of the passage 20. A section of this spring adjacent its outer end is anchored to the frame post 17 and its inner end carries an offset portion 84 forming a stop or lug which engages the stem of each bolt that is advanced by the plunger 40. This stop holds the bolt upright and prevents the same from being moved beyond the proper location between the adjacent ends of the plungers 43 and 52. However, this stop is adapted to be shifted laterally out of the passage 20 by deflection of the spring when a bolt of irregular form is pushed out of the pocket and into the passage 20.

In describing the construction and operation of the sorting machine illustrated in the drawings, reference has consistently been made to threaded bolts as the articles to be sorted and the gauge elements are shown as having teeth 32. However, it should be understood that unthreaded bolt blanks and various other articles can be sorted and gauged by the use of a similar machine but wherein the gauge is formed by plain elements, that is elements not having the teeth 32.

It will be seen from the drawings that the stems of the bolts extend downwardly in the passages 20, 25 and in the passage 27 leading to the gauge opening. These passages are of a width to permit the bolt stems to move freely therein, while the bolt heads engage and slide along the upper surface of the plates 18, 19 and 24. When the gauge elements are provided with teeth 32 for the gauging or sorting of threaded bolts, as in this instance, the plates 18 and 24 are preferably not clamped tight against the posts 16 and 22 of the frame but are permitted slight vertical shifting movement. To provide for this movement these plates are mounted on the posts by providing compression springs 86 which surround the screws 87 and press the plates against the posts. This arrangement permits the bolt to move upwardly or downwardly to mesh with the teeth 32 of the gauge elements without subjecting the plates or the gauge to undesirable stresses. If downward shifting of the bolt occurs the inner ends of the plates 24 and 18 move downwardly, this being permitted by a rocking of the plates between the springs 86 and the ends of the posts upon which the plates are mounted.

I have stated that the gauge elements 30 are adjustable in the gauge block 31 and, for this purpose set screws 88 may be provided in the gauge block to act on the elements to secure the desired spacing thereof. Clamping screws 89 extending through slots 90 of the gauge block may also be provided for clamping the elements in the desired adjusted position.

My sorting machine can also readily be used for gauging or sorting bolts or other articles as to length and, in Fig. 8 of the drawings, I have shown an arrangement whereby this may be accomplished. In this arrangement the passage 27' leading to the gauge is defined by the adjacent ends of the plates 24' and 18'. The gauge itself comprises a block 31' in which a gauge element 91 is mounted to provide a gauge passage in the form of a groove 94 which is parallel with the passage 27' but spaced therebelow. The gauge block 31 is mounted on the frame post 16' so that the bottom 95 of the groove 94 will be in predetermined spaced relation to the lower face of a plate 96. The latter plate is clamped to the plate 18' with intervening spacing plates 97 so as to provide a space 98, above the passage 27', to accommodate the heads of the bolts. If the bolts being sorted are of satisfactory length they will be pushed through between the plate 96 and the bottom 95 of the gauge passage, but if they are too long or of irregular form they will jam in the gauge passage and will be temporarily retained therein to be subsequently ejected by a plunger corresponding with the plunger 52.

From the foregoing description and accompanying drawings it will now be readily seen that I have provided an improved sorting machine having novel means for feeding bolts or other articles to a gauge in such a manner that articles of irregular or unsatisfactory form will be selected by the gauge and subsequently ejected therefrom. It will be seen furthermore that the operation of my sorting machine is automatic such that it will operate substantially continuously to separate out unsatisfactory articles without attention from an operator other than to see that a supply of articles is available in the magazine.

Having thus described my invention, I claim:

1. In a machine of the character described a pair of spaced gauge elements adapted to permit passage therebetween of articles of a given characteristic, means providing a passage leading to the gauge, a pair of plungers having their adjacent ends spaced to receive individual articles therebetween and reciprocable in said passage for conveying the articles to and from the gauge, means for supplying the individual articles to the space between the plungers, and means operable to cause reciprocation of the plungers, including a yieldable connection adapted to permit shifting of one plunger relative to the other when an article of other characteristic reaches the gauge.

2. In a sorting machine, a gauge comprising a pair of gauge elements spaced to accommodate an article of a given characteristic, means providing a passage leading between said elements, a member movable in said passage for advancing articles to the gauge, means providing substantially aligned article supply and discharge openings leading into said passage ahead of the gauge, means for moving individual articles into said passage through the supply opening, and means operable to return articles of unsatisfactory characteristic from the gauge to a point in said pasasge substantially opposite the discharge opening.

3. In an article gauging machine, a gauge, means providing a passage leading to said gauge, means providing substantially aligned supply and discharge passages connecting with the first passage from opposite sides thereof, a reciprocable member operable in the first passage to advance articles from the passage intersection to the gauge, a second member reciprocable in said first passage for returning unsatisfactory articles from the gauge to said intersection, a magazine connecting with said supply passage at a point offset from said intersection, and a member reciprocable in said supply passage for moving individual articles from the magazine to the intersection and for displacing returned articles from the intersection into said discharge passage, said passages and members all being in substantially the same horizontal plane.

4. In an article gauging machine, a frame, a gauge mounted thereon, a table on said frame having an article guiding slot therein leading to said gauge and substantially aligned article guiding supply and discharge slots intersecting the first slot ahead of the gauge, means reciprocable in said first slot for moving individual articles

from the intersection to the gauge and for returning certain of said articles from the gauge to the intersection, and a memebr reciprocable in said supply passage for feeding individual articles in succession to the intersection, the operation of said reciprocable member and said reciprocable means being timed such that the return of an article from the gauge to the intersection precedes the feeding of an article from the supply slot to the intersection.

5. In a machine for gauging articles of the type having a head and a stem, a frame, a gauge on the frame having a passage for gauging the stems of articles presented thereto, a table on the frame for movably supporting the articles by engagement under the heads thereof and having article guiding slots receiving the stems and comprising a slot leading to the gauge and supply and discharge slots connecting with the first slot from opposite sides thereof, means reciprocable in said first slot for moving articles to the gauge and returning certain articles to the slot intersection, and a member reciprocable in said supply slot for feeding individual articles to said intersection and ejecting the return articles therefrom.

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