Oct. 31, 1944. J. M. HOTHERSALL 2,361,401

SCORING MACHINE

Filed June 11, 1941 6 Sheets-Sheet 1

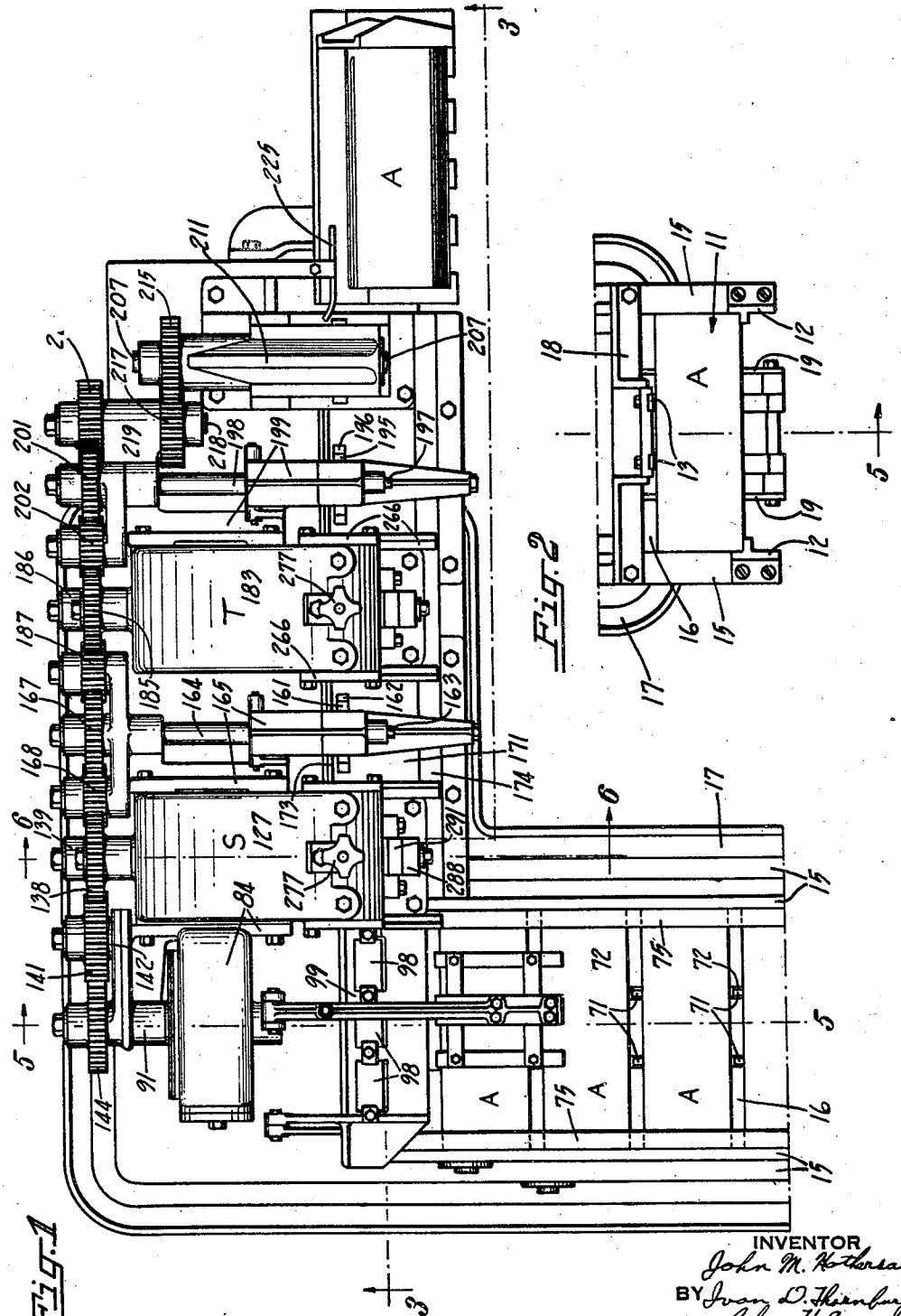



Fig. 1

Fig. 2

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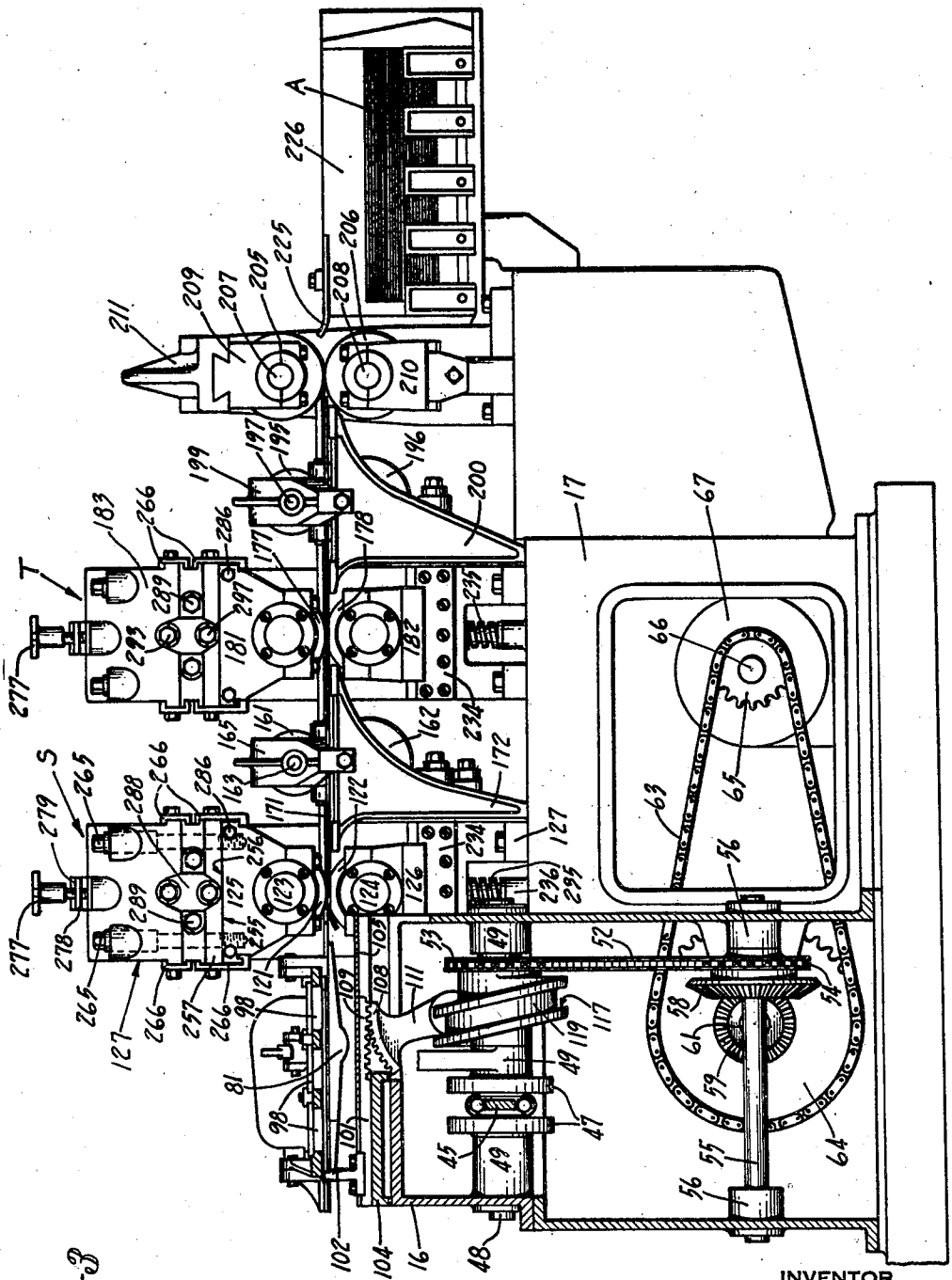



Fig. 3

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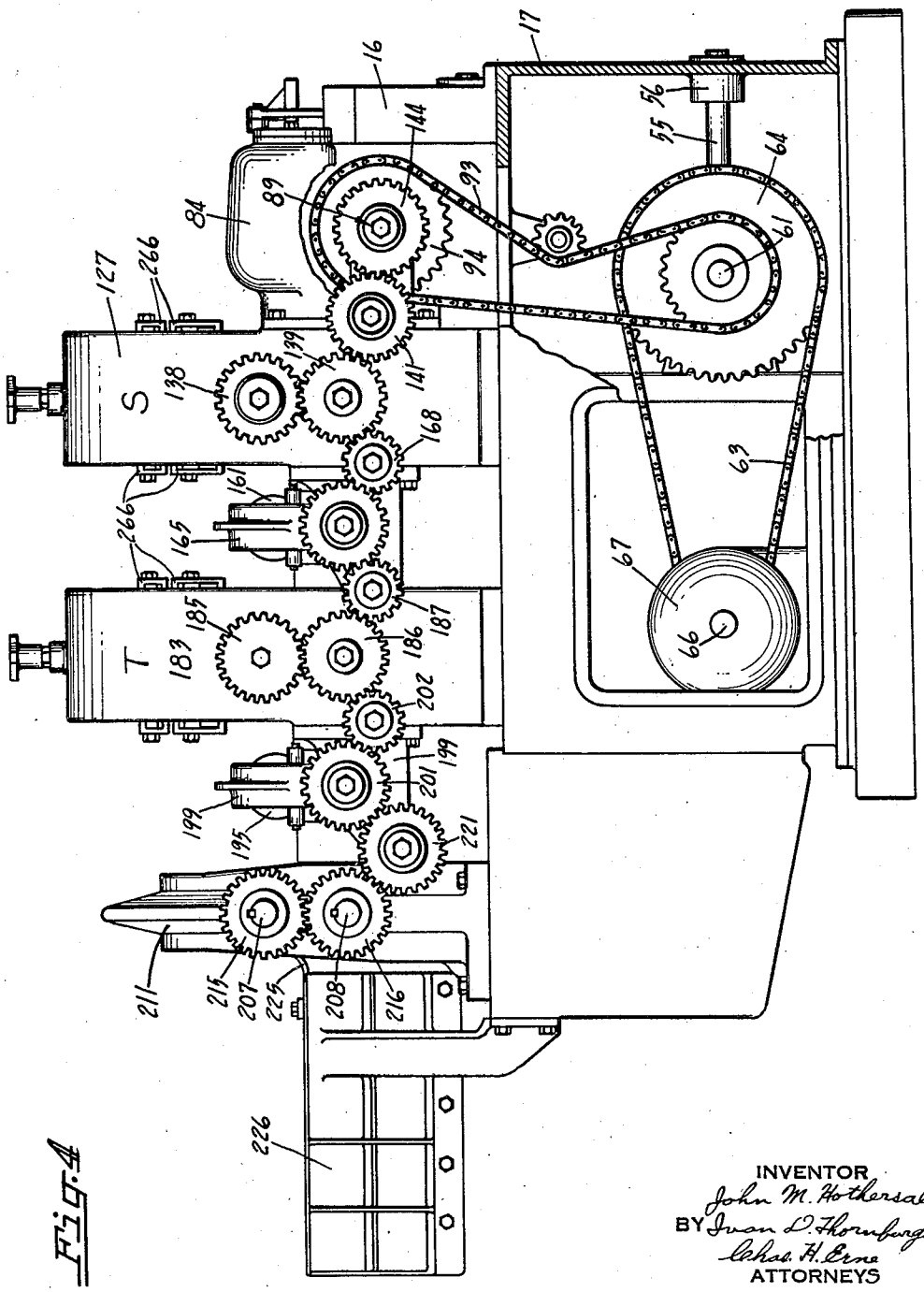



FIG. 4

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SCORING MACHINE

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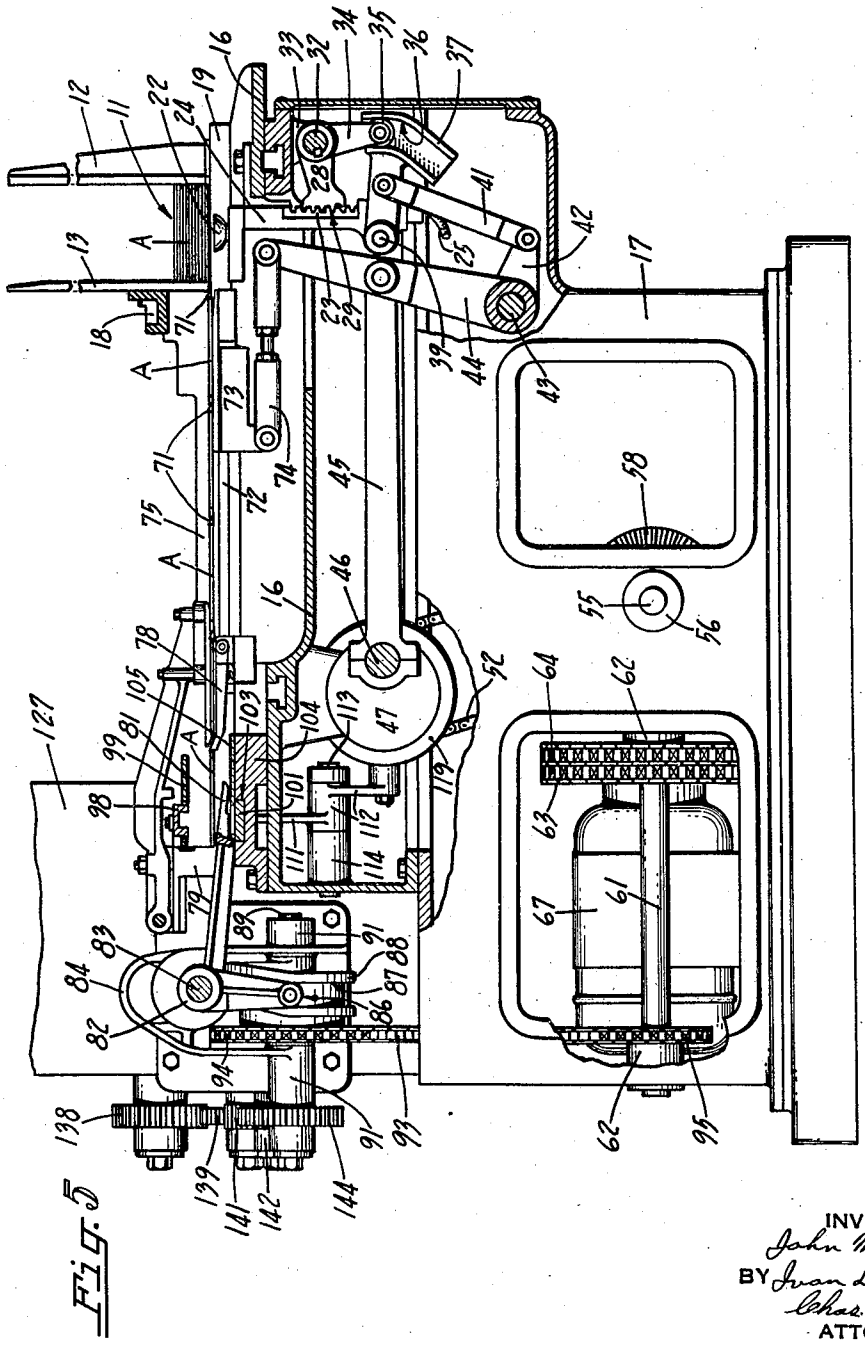


Fig. 5

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SCORING MACHINE

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Fig. 7

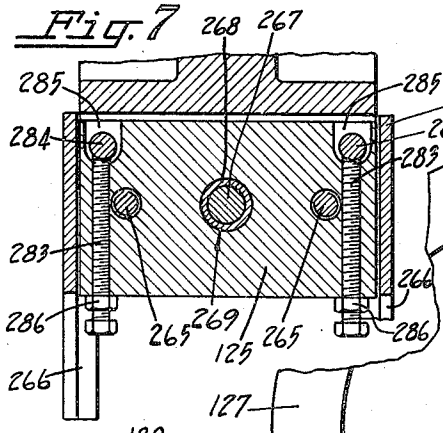



Fig. 6




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Fig. 10

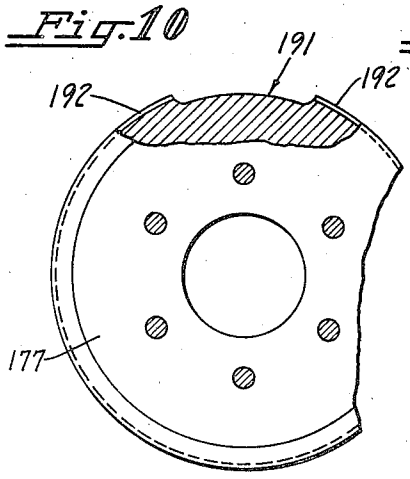



Fig. 12

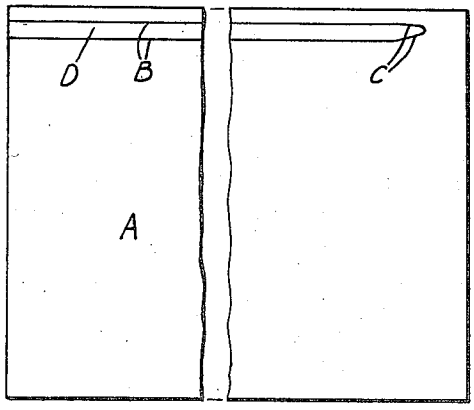



Fig. 9

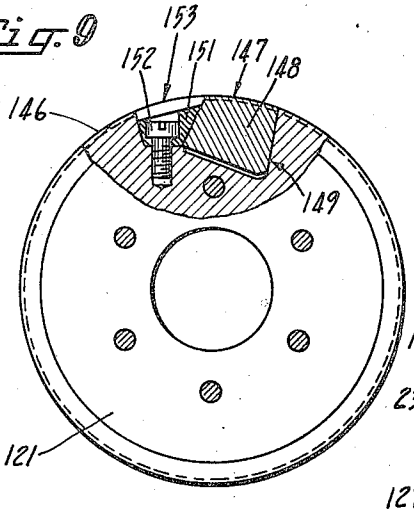



Fig. 11

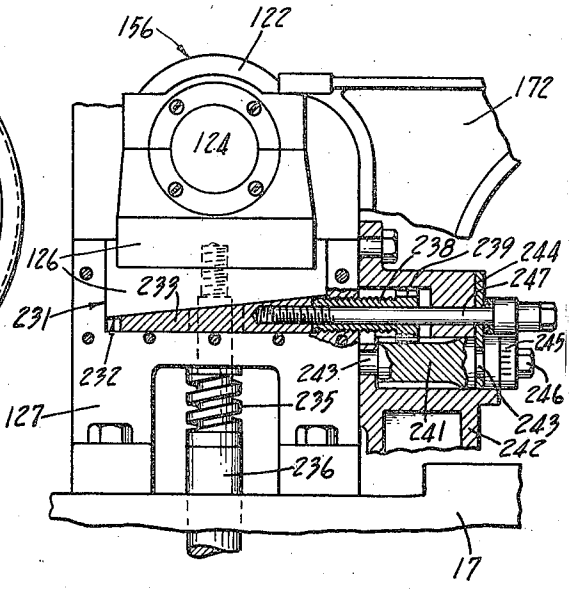
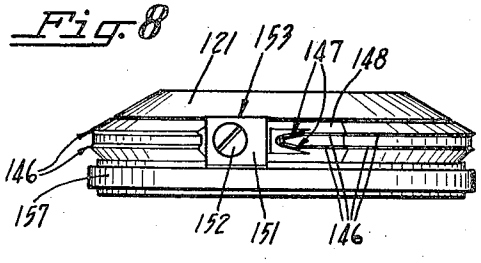



Fig. 8




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Patented Oct. 31, 1944

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# UNITED STATES PATENT OFFICE

2,361,401

## SCORING MACHINE

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Application June 11, 1941, Serial No. 397,626

8 Claims. (Cl. 113—15)

The present invention relates to scoring machines for impressing weakening lines in metallic surfaces and has particular reference to such a machine which terminates the score lines by joining the ends within the boundaries of the surface.

In the manufacture of the well known tearing strip container or can which is adapted to be opened by the removal of a portion of the body wall bounded by weakened or score lines, it is sometimes desirable to leave the can cover, which results from the removal of the tearing strip, attached to the can body by a hinge portion of the body wall. This is effected sometimes by forming in the body wall a tearing strip that extends only partially around the can body, the score lines terminating and joining each other within the confines of the body and adjacent the side seam thereof so that a portion of the body wall adjacent the end of the tearing strip remains intact and serves as a hinge when the tearing strip is removed.

The present invention contemplates the provision of a scoring machine for scoring can body blanks from which such hinge cover cans are made.

An object therefore of the invention is the provision of a machine for scoring or impressing weakening lines in metallic surfaces wherein the weakening lines do not extend through the edge but are confined within the surface being scored.

Another object is the provision of such a scoring machine wherein the impressing of the score lines is effected by rotating rollers which operate to set off a tearing strip in a can body blank and which further operate to terminate the tearing strip in a predetermined position within the confines of the blank so that an unscored portion of the blank will be left adjacent the terminal end of the tearing strip.

Another object is the provision of a scoring machine of this character wherein the scoring rollers are carried in universal mountings which permit of the removal of a scoring roller without disturbing the setting of the mounting and which further permit of adjustment of the scoring roller in three directions so that the roller may be precisely located relative to the blank being scored.

Another object is the provision of such a scoring machine wherein the blanks to be scored may be fed rapidly into scoring association with the scoring rollers and in synchronism with the rotation of the scoring rollers so that the tearing strip will be set off in a predetermined position in the blank.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figures 1 and 2 when taken together illustrate a top plan view of a scoring machine embodying the instant invention;

Fig. 3 is a longitudinal part section and part elevation taken substantially along the broken line 3—3 in Fig. 1;

Fig. 4 is a rear view of the machine shown in Fig. 1, with parts broken away and shown in section;

Fig. 5 is a transverse part section and part elevation taken substantially along the line 5—5 in Figs. 1 and 2;

Fig. 6 is an enlarged sectional view taken substantially along the line 6—6 in Fig. 1, with parts broken away;

Fig. 7 is a horizontal section taken substantially along the line 7—7 in Fig. 6;

Fig. 8 is an edge view of one of the scoring rollers;

Fig. 9 is a side view of the roller shown in Fig. 8, with parts broken away and parts shown in section;

Fig. 10 is a fragmentary side view of another scoring roller, with a portion broken away and shown in section;

Fig. 11 is a part elevation and part sectional view of one of the anvil rollers and its mounting shown in the lower right of Fig. 6; and

Fig. 12 is a plan view of a can body blank having a tearing strip set off by score lines impressed in the surface of the blank by the present machine.

As a preferred embodiment of the instant invention the drawings illustrate a scoring machine in which a sheet metal rectangular can body blank A (Fig. 12) is impressed with a pair of spaced and parallel score lines B located in a predetermined portion in the blank. Such a can body blank preferably is for use in forming round or other shaped can bodies used in cans of the character disclosed in United States Patent 1,737,020, issued November 26, 1929, to J. F. Peters, on Tear open tobacco can.

The score lines B extend from one side seam edge of the blank toward the other and terminate short of this latter edge. The score lines adjacent one end of the blank are joined by way of short angularly disposed connecting score lines C which together with the score lines B set off a removable tearing strip D which is adapted to be torn away to open a can having a body made from such a blank.

The plain blanks A to be scored are fed from a stack of such blanks retained in a magazine 11 (Figs. 2 and 5) which includes vertical front and rear retaining bars 12, 13 which hold the stack of blanks in place. The front retaining

bars 12 are secured to the outer ends of a pair of horizontal spaced and parallel guide rails 15 which are attached to the top of a bed plate 16 bolted to a frame 17 which constitutes the main frame of the machine. The rear retaining bars 13 are secured to a transverse bridge member 18 the ends of which are bolted to the guide rails 15. The entire stack of blanks rests on a pair of short spaced and parallel support rails 19 which are secured to the bed plate.

The blanks A are fed individually from the bottom of the stack and preparatory to this feeding operation, the lowermost blank in the stack is pulled down in the middle by a vacuum cup 22 (Fig. 5) which is located between the stack support rails 19. The vacuum cup is fixed to the upper end of a stem 23 which slides up and down in the slideway of a bracket 24 secured to the machine frame 17. The lower end of the stem is connected to a flexible hose 25 which leads from any suitable source of vacuum and this hose communicates with a passageway in the stem which leads to the vacuum cup.

The vacuum cup 22 is shifted vertically by a segment gear 28 which meshes with a rack 29 formed in the cup stem 23. The gear is mounted on a rocker shaft 32 which is carried in bearings 33 formed in the main frame 17. The rocker shaft is actuated by an arm 34 which is carried on the shaft. The outer end of the arm carries a cam roller 35 which operates in a cam groove 36 of a cam 37 formed on a lever 38.

The lever 38 is mounted on a pivot pin 39 carried in a boss formed on the cup stem slideway bracket 24. The lever is connected by a link 41 to an arm 42 mounted on a cross shaft 43 carried in suitable bearings in the main frame 17. The shaft carries a rocker lever 44 which is connected to a crank rod 45. The crank rod surrounds a crank pin 46 secured in an eccentric position in a pair of spaced crank discs 47 of a crank shaft 48 (see also Fig. 3). The crank shaft is journaled in a plurality of bearings 49 in the main frame 17.

The crank shaft 48 is continuously rotated by an endless chain 52 which operates over a sprocket 53 mounted on the crank shaft and over a sprocket 54 which is carried on an auxiliary drive shaft 55 journaled in bearings 56 in the main frame 17. The auxiliary drive shaft carries a bevel gear 58 which meshes with a bevel pinion 59 mounted on a shaft 61 (Fig. 5) journaled in bearings 62 in the main frame.

This shaft is rotated by an endless chain 63 which operates over a driven sprocket 64 mounted on the shaft and over a driving sprocket 65 which is mounted on a rotor shaft 66 of an electric motor 67. This electric motor is the main source of power for operating the entire machine.

When a blank A is pulled down by the vacuum cup 22 from the magazine 11 it is immediately engaged along its rear edge by feed dogs 71 (Figs. 1 and 5) which are carried in a pair of spaced and parallel reciprocating feed bars 72 located below the magazine. There are a plurality of these feed dogs equally spaced along the length of the feed bars. These feed bars slide in suitable grooves formed in the machine bed plate 16. The feed bars are secured to a tie-bracket 73 which is connected by a link 74 to the upper end of the rocker lever 44.

Hence as the rocker lever 44 operates to actuate the vacuum cup 22, it also reciprocates the feed bars 72 through a forward or feeding stroke and thence through a backward or return stroke. This reciprocation of the feed bars first removes the pulled down blank A from the magazine and then advances it along a straight line path of travel through several idle stations in the machine, in an intermittent or step-by-step movement. The guide rails 15 hereinbefore mentioned, guide the blanks through the idle stations while a pair of hold-down bars 75 frictionally engage against the top surfaces of the blanks and prevent them from being shifted back with the feed dogs on the return stroke of the feed bars.

At the inner end of the path of travel of the advancing blanks A, the innermost blank in the procession is pushed forward by a long finger 78 on the feed bars 72 and is received against a stationary gauge block 79 (Fig. 5) which is mounted on the bed plate 16. In this position, the blank is disposed directly above a substantially horizontal lifter arm 81 which immediately operates to lift the gauged blank above the path of travel of the succeeding blanks in the procession.

The lifter arm 81 constitutes one leg of a bell crank 82 mounted on a pivot shaft 83 carried in suitable bearings formed in a housing bracket 84 secured to an adjacent part of the machine frame. The vertical leg of the bell crank carries a cam roller 86 which operates in a cam groove 87 of a barrel cam 88 mounted on a shaft 89 journaled in bearings 91 in the housing bracket 84. This cam shaft is rotated in time with the reciprocation of the feed bars 72, by an endless chain 93 which operates over a driven sprocket 94 on the cam shaft and over a driving sprocket 95 on the shaft 61 which is driven by the electric motor 67.

The lifter arm 81 lifts a blank A into engagement with a row of permanent magnets 98 which are secured in an overhanging shelf 99 of the gauge block 79. The raised blank clings to the magnets at this higher level where it is in endwise alignment with a cross feeding device disposed at right angles to the entrance feeding device just explained.

The cross feeding device advances the blanks lengthwise along a straight line path of travel for the scoring operations. Because of the greater length of some can body blanks as compared with their width, the lift transfer of the blanks from one level to another results in a more rapid and more efficient passage of the blanks through the machine.

The cross feeding device includes a reciprocating feed bar 101 (Figs. 3 and 5) having a single upright feed dog 102 secured thereto. The feed bar slides in a slideway 103 formed in a block 104 bolted to the bed plate 16. A flat plate 105 secured to the top of the block confines the feed bar in its slideway.

The feed bar 101 is reciprocated through a short forward feeding stroke and thence through a return stroke by a segment gear 108 which meshes with a rack 109 formed in the bottom of the feed bar. The segment gear is part of a rocker arm 111 formed on a lever 112 mounted on a pivot shaft 113 carried in a boss 114 on the bed plate 16. The lever carries a cam roller which operates in a cam groove 117 of a barrel cam 119 mounted on and rotated by the shaft 48.

Hence as the shaft 48 rotates, it revolves the cam 119 and this rocks the lever 112 and arm 111 to reciprocate the feed bar 101. On the forward stroke of the feed bar the feed dog 102 engages against the outer end of the blank which is retained in an elevated position beneath and against the magnets 98 and slides the blank end-

wise along the magnets and along the gauge block 79. This advancement of the blank covers only a short distance which is sufficient to bring the forward end of the blank into a first operation scoring station S and into the grip of a pair of rotating rollers which includes an upper first operation scoring roller 121 and a lower anvil roller 122 (Figs. 3 and 6).

The scoring roller 121 and the anvil roller 122 are formed with trunnions 123, 124 which are journaled in respective bearing blocks 125, 126. The bearing blocks are adjustably disposed in a manner to be hereinafter explained, adjacent a housing 127 which is bolted to the machine frame 17. The inner trunnion of each roller is formed with a tongue 131 which engages in a notch 132 in the inner end of respective drive shafts 133, 134. These drive shafts extend through sleeves 135 which are secured in bores 136 in the housing 127 and the outer ends of the shafts are journaled in bearings 137 formed in the housings.

The scoring roller 121 and the anvil roller 122 are rotated in unison by respective meshing gears 138, 139 which are mounted on the outer ends of the drive shafts 133, 134. These gears are rotated in time with the other moving parts of the machine by an intermediate gear 141 (Figs. 1, 4 and 5) which meshes with the anvil roller gear 139 and which is carried on a short shaft secured in a boss 142 formed in the bracket 84. The bracket 84 is bolted to the housing 127.

The intermediate gear 141 meshes with and is driven by a main driving gear 144 which is mounted on the continuously rotating shaft 89 in the bracket 84. Shaft 89 is driven from the electric motor 67 and hence the gear train just explained and the scoring roller 121 and the anvil roller 122 are likewise rotated in time with the other moving parts of the machine. In this manner the scoring roller 121 is rotated in synchronism with the passage of a blank A through the machine and principally with the entrance of the blank into the grip of the rollers 121, 122.

When the forward end of the blank A is gripped between the scoring roller 121 and the anvil roller 122 it is drawn in by the rollers and advanced endwise through the machine. During this passage between the rollers the blank is scored or impressed with the score lines B, C. For this purpose the scoring roller 121 is made with a circumference equal to the length of the blank A plus the space between two adjacent blanks.

The outer surface of the scoring roller 121 is formed with a pair of spaced and parallel raised cutting edges 146 (see also Figs. 8 and 9) which extend around the roller for nearly its full circumference. These cutting edges 146 impress the straight score lines B into the blank. The angularly disposed junction score lines C are impressed in the blank by corresponding cutting edges 147 which are formed in an insert block 148 located in a recess 149 in the scoring roller.

The insert block 148 is held in place by a tapered key 151 which is disposed in the recess 149 adjacent the block and which is secured by a screw 152 against displacement. The key is sunk below the surface of the roller to provide a clearance space 153 between the terminal ends of the cutting edges. These raised cutting edges 146, 147 cooperate with a flat outer face 156 (Fig. 6) of the anvil roller 122 in impressing the score lines in the blank.

When a blank A first enters between the scoring roller 121 and the anvil roller 122, the clearance space 153 in the scoring roller is in a position adjacent the anvil roller so that the forward edge of the blank will enter into the clearance space. The scoring roller rotates in a counter-clockwise direction as viewed in Fig. 9 and thus scoring of the blank will not begin until the cutting edges 147 of the insert 148 come into engagement with the blank. However, the blank is in the grip of the rollers and begins to advance through the rollers as they rotate. This is brought about by a rubber feed ring 157, (Fig. 8) which is carried on the scoring roller and which presses the blank down against the anvil roller and thus advances it between the rollers.

The engagement between the insert cutting edges 147 and the blank takes place a predetermined distance inwardly of the front edge of the blank, as shown in Fig. 12, and this distance is determined by the relative timing between the cross feed bar 101 and the scoring roller. When the insert cutting edges come into this engagement with the blank the scoring operation begins at the junction lines C and continues by way of the cutting edges 146 to the rear end of the blank as the rollers revolve and thus feed the blank forward. This constitutes a first scoring operation in which the heavy scoring of the blank is effected to a predetermined approximate depth of score cut.

Following this first scoring operation, the blank is further advanced by a pair of feed rollers 161, 162 (Figs. 1 and 6) between which the blank passes. These rollers are mounted on respective shafts 163, 164 journaled in bearings formed in a bracket 165 which is bolted to a side of the scoring roller housing 127. The upper feed roller 161 rotates by frictional engagement with the lower roller 162 when the blank is not interposed therebetween. The lower roller is positively driven in time with the other moving parts of the machine by a spur gear 167 (Figs. 1 and 4) which is mounted on the outer end of the shaft 164. This gear meshes with and is driven through an idler gear 168 which also meshes with the scoring roller gear 139. The idler gear is mounted on a short shaft carried in the bracket 165.

The feed rollers 161, 162 advance the blanks along a longitudinal table 171 which is secured to a table bracket 172 bolted to a side of the scoring roller housing 127. During their passage along the table the blanks are held in line by an inner side guide 173 and an outer side guide 174 between which the blanks pass. The guides are secured to the table 171.

The feed rollers 161, 162 transfer the blank A from the first operation scoring station S into a second operation scoring station T. At the latter station, the score is made deeper and wider to precise dimensions. This second scoring operation is effected by an auxiliary scoring roller 177 (Fig. 3) and an auxiliary anvil roller 178 which are supported in respective bearing blocks 181, 182 disposed adjacent a housing 183 bolted to the machine frame 17. The bearing blocks are identical with the bearing blocks 125, 126 which are located at the first operation scoring station S.

The auxiliary scoring roller 177 is rotated in the same manner as the scoring roller 121, in this case by a gear 185 (Fig. 4) which is mounted on the outer end of a roller shaft which may be journaled in the housing 183. The auxiliary anvil roller 178 is similarly rotated by a gear 186

which meshes with the gear 185 and which is mounted on the outer end of a shaft journaled in the housing 183. The auxiliary anvil gear 186 meshes with an idler gear 187 mounted on a short shaft carried in the feed roller bracket 165. The idler gear 187 meshes with and is driven by the feed roller gear 167.

Hence through this gear train the auxiliary scoring roller 177 and the auxiliary anvil roller 178 are rotated in unison and also in time with the first operation scoring roller 121 and the feed rollers 161, 162. This brings the blank into the grip of the second operation scoring roller 177 in the same relative position to the roller as it occupied when it first entered the grip of the first operation scoring roller 121.

For best results it has been found practical to eliminate the re-scoring or second operation scoring of the connecting score lines C in the blank. For this purpose the second operation or auxiliary scoring roller 177 is formed with a clearance recess 191 (see Fig. 10) in its periphery in the place which corresponds to the insert block 148 in the first operation scoring roller 121. Otherwise the second operation scoring roller 177 and its anvil roller 178 are identical with the first operation scoring roller 121 and its anvil roller 122.

Hence when the forward edge of the blank A advances into the grip of the second operation scoring roller 177 and its anvil roller 178 it enters into the recess 191 of the scoring roller and no scoring operation takes place until the straight score lines B move adjacent the rollers. These lines B are re-scored as the blanks advance between the rollers by a pair of spaced and parallel scoring or cutting edges 192 (Fig. 10) which are formed on the auxiliary scoring roller 177. These cutting edges extend around the scoring roller and terminate adjacent the clearance recess 191.

Following the second scoring operation the scored blank A is further advanced along the table 171 by a pair of cooperating auxiliary feed rollers 195, 196 (Figs. 1 and 3). These rollers are or may be identical with the feed rollers 161, 162 and are mounted on shafts 197, 198 journaled in a bracket 199 bolted to the auxiliary scoring roller housing 183. Adjacent these rollers, the table 171 is supported on a bracket 200 which is bolted to a side of the housing 183. The lower roller 196 is the driving roller and this is rotated by a gear 201 (Fig. 4) which is carried on the outer end of the roller shaft 198. Gear 201 meshes with and is driven through an idler gear 202 which meshes with the auxiliary anvil roller gear 186.

The auxiliary feed rollers 195, 196 advance the scored blank A into position between a pair of flattening rollers 205, 206 (Fig. 3) which press down any portions of the blank adjacent the score lines which have been raised during the scoring operations. These flattening rollers are mounted on respective shafts 207, 208 which are journaled in bearing blocks 209, 210 adjustably disposed in a bracket 211 bolted to the machine frame 17. The outer ends of the shafts 207, 208 carry meshing drive gears 215, 216 (Fig. 4). The lower gear 216 meshes with and is driven by a gear 217 (Fig. 1) which is mounted on a short shaft 218 journaled in a bearing 219 formed in the feed roller bracket 199. The outer end of the shaft carries a gear 221 which meshes with and is driven by the feed roller gear 201.

As a scored blank A leaves the flattening rollers 205, 206 it engages against a deflector bar 225 which is bolted to a magazine rack 226 secured to the machine frame 17. The deflector bar guides the blank into the magazine where it falls into position on the top of a stack of such blanks previously discharged from the rollers. This completes the travel of a blank through the machine. The blanks are removed by hand from this magazine as needed for subsequent operations.

A more detailed explanation of the scoring roller and anvil roller mountings will now be given. These mountings are the same for both sets of scoring rollers and for both sets of anvil rollers and hence an explanation of one set of the rollers will be sufficient for both.

The anvil rollers 122, 178 are adjustable vertically with respect to the scoring rollers so that the depth of the score cut may be controlled. For this purpose the anvil roller bearing block 126 is disposed within a slideway 231 (Figs. 6 and 11) in the base of the housing 127 and the bottom of the bearing block is formed with a tapered surface 232 which engages against a tapered wedge 233 located in the bottom of the slideway. The bearing block and the wedge are retained in place within the slideway by a flat plate 234 which is secured to the outside of the housing 127.

The bearing block and the wedge are held tightly together and against the bottom of the slideway by a compression spring 235 which surrounds the shank of a stud 236 which extends up through the bottom of the slideway and through the wedge and is threaded into the bearing block. The spring is interposed between the housing 127 and an enlarged head on the stud.

Adjustment of the anvil bearing block 126 and the anvil roller 122 carried therein is effected by shifting the wedge 233 horizontally along the bottom of the slideway. This is brought about by a screw sleeve 238 (Fig. 11) which is threaded into the housing 127 adjacent the slideway 231. The inner end of the sleeve abuts against the large end of the wedge 233. The outer end of the sleeve is formed with actuating gear teeth 239 which mesh with a micrometer gear 241 disposed in a casing 242 bolted to the housing 127. The casing also encloses the screw sleeve 238 and its gear 239.

At its ends, the micrometer gear or screw 241 is formed with trunnions 243. The inner trunnion is carried in the casing 242 while the outer trunnion is supported in a removable plate 244 which is secured to the casing. The outer trunnion also carries a graduated collar 245 and a nut 246 to which a wrench may be applied for turning the micrometer gear.

Hence when the micrometer gear 241 is turned, it rotates the screw sleeve 238 by way of its gear teeth 239 and thus shifts the wedge 233 horizontally. Such a movement of the wedge shifts the anvil bearing block vertically into the desired position. After such an adjustment the wedge is locked in place against the inner end of the screw sleeve by a long locking stud 247. This stud extends through the plate 244, the casing 242, the screw sleeve 238 and is threaded into the large end of the wedge. Locking of the wedge is effected by tightening of the stud and conversely when an adjustment is to be made the stud must first be loosened. The stud is also utilized to draw the wedge outwardly when it is desired to lower the anvil bearing block 126.

The mounting for the scoring roller bearing block 125 will now be considered. This block is mounted so that it may be accurately adjusted in three directions so that the scoring rollers 121, 177 may be properly aligned relative to each other and to the blank being scored. For this purpose

the top of the bearing block 125 is formed with a flat surface 255 (Figs. 3 and 6) which seats against a flat bottom surface 256 of a swivel plate 257. The top of this swivel plate is formed with a convex surface 258 which extends transversely of the plate and which seats against a concave surface 259 of a seat plate 261. The top of the seat plate is flat and seats against an overhanging head section 262 of the housing 127.

The bearing block 125, the swivel plate 257 and the seat plate 261 are held together and are clamped against the head section 262 of the housing 127 by a pair of long bolts 265 (Fig. 3) which extend down through these parts and have their lower ends threaded into the bearing block. After an adjustment of the bearing block the bolts are screwed up tight to clamp and lock the parts in their adjusted position. The bearing block and its associated swivel plate and seat plate are retained against endwise displacement by side clamps 266 which are bolted to the swivel plate and to the housing.

The first of the adjustments possible with such a construction of bearing mounting is for rotating the bearing block 125 horizontally so that the first and the second operation scoring rollers 121, 177 may be brought into parallelism. To bring this about the bearing block is rotatable about a pivot button 267 (Fig. 6) which is disposed within a bushing 268 transversely divided at the juncture of surfaces 255, 256. The lower bushing section is seated in a recess 269 formed in bearing block 125—the upper section in a hole 271 in the swivel plate 257. The button is located horizontally at the engaging surfaces 255, 256 of the bearing block and the swivel plate and is located vertically in alignment with the cutting edges 146 of the scoring roller.

The button 267 is formed on the lower end of a rod 273 which extends up through the hole 271 in the swivel plate and up through aligning clearance holes 274, 275, respectively formed in the seat plate 261 and the housing head section 262. The upper end of the rod is formed with a head 276 which rests on top of the housing head section 262 and thus retains the button in its proper pivotal position.

The rod 273 is held in place by a thumb screw 277 which is threaded into the upper end of the rod. The screw is formed intermediate its length with a disc-like projection 278 which fits into a groove 279 of a block 281 secured to the top of the housing. This disc section provides for fine adjustment of the button 267 by turning the thumb screw and also provides for lifting the button up out of its pivotal position so the bearing block may be removed when desired.

Turning of the bearing block 125 on its pivot button 267 is brought about by adjustment of a pair of long screws 283 (Figs. 6 and 7) which are threaded into the bearing block. The inner ends of the screws engage against depending pins 284 which are secured in the bottom of the swivel plate 257 and which extend down into clearance openings 285 formed in the bearing block.

Thus by loosening one of the screws 283 and tightening up on the other a force is exerted against the proper pin 284 to rotate the bearing block relative to the stationary swivel plate 257. After such an adjustment the screws 283 are locked in adjusted position by locknuts 286 which are carried on the screws.

It is sometimes desirable to cut one score line B in the blank to a greater or lessser depth than the other and this brings into play the second adjustment possible with this construction of mounting. This is brought about by tilting the scoring roller through the shifting of the swivel plate 257 and the bearing block carried thereon relative to the seat plate 261. For this purpose the seat plate has a clamp block 288 secured to it by bolts 289.

The clamp block 288 carries a seat plate micrometer adjusting sleeve 291 which is threaded into the block. The inner end of the sleeve rests against a swivel washer 292. A bolt 293 which extends through the sleeve and through the washer and is threaded into the housing head section 262, adjustably secures the clamp block to the housing 127. This bolt retains the entire unit of bearing block, swivel plate, and seat plate in place relative to the housing 127.

In a similar manner the clamp block 288 is adjustably secured to the swivel plate 257. This is brought about by a swivel plate micrometer adjusting sleeve 295 which is threaded into the clamp block. The inner end of the sleeve rests against a swivel washer 296. A bolt 297 extends through the sleeve and through the washer and is threaded into the swivel plate and this bolt secures the plate to the clamp block.

Thus by loosening the bolt 297 and rotating the sleeve 295 by means of spanner wrench holes provided in the sleeve, the swivel plate 257 may be shifted through an arc inwardly or outwardly in its concave seat in the seat plate 261 and this shifting of the swivel plate tilts the bearing block 125 and the scoring roller 121 carried therein to the angle desired. After such an adjustment the swivel plate is locked in its new position by tightening the bolt 297.

The third adjustment of the scoring roller 121 has to do with shifting the roller inwardly or outwardly relative to the longitudinal edge of the blank being scored, to bring the first and second operation scoring rollers into longitudinal alignment relative to the edge of the blank. Such an adjustment is effected by loosening the bolt 293 in the adjusting sleeve 291 and rotating the sleeve in the proper direction.

This shifts the seat plate 261, and the swivel plate 257 and bearing block 125 carried thereon as a unit outwardly or inwardly as the case may be and thus brings the scoring roller into the desired position. After such an adjustment the seat plate is locked in its new position by tightening of the bolt 293.

Thus with such a scoring roller mounting construction, the scoring roller may in fact be universally adjusted in almost any desired direction with micrometer accuracy. The adjusting sleeves and screws provide this micrometer accuracy and the location of the adjusting elements further results in a mounting construction which permits of removing the scoring roller bearing block and its return to its mounting without in any way interfering with the adjustment of the block or the scoring roller carried therein.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a scoring machine, the combination of devices for feeding a blank of sheet material

along a predetermined path of travel, a first operation scoring roller and an anvil roller between which the blank is advanced to receive a scoring operation, said scoring roller having a pair of spaced and parallel scoring edges extending around said roller and terminating adjacent a recess for producing parallel score lines part way across said blank to leave an unscored portion therein, an insert carried in said roller between the ends of said scoring edges, said insert having an auxiliary score edge forming a continuation of and a connection between the parallel score edges of said roller at one end of the score lines, a second operation scoring roller and a second anvil roller between which the blank passes to receive a re-score cut of a portion of the score lines in the blank, said second operation scoring roller having a pair of spaced and parallel scoring edges and a recess in its periphery, and means for rotating said second rollers in time with the advancement of the blank along its path of travel to cut deeper the score lines previously cut by the first operation roller parallel scoring edges and to leave unaltered the score lines previously cut by the auxiliary score edge of said first operation insert.

2. In a scoring machine, the combination of a pair of cooperating rollers between which a blank of sheet material is passed for performing a scoring operation thereupon, one of said rollers having a pair of spaced and parallel annular scoring edges extending therearound for cutting a pair of parallel score lines in the blank, means for rotating said rollers, and devices for shifting one of said rollers for cutting one of said score lines in the blank deeper than the other.

3. In a scoring machine, the combination of an anvil roller, a scoring roller adjacent said anvil roller for performing a scoring operation upon a blank passed between said rollers, a housing adjacent said rollers, a bearing block in said housing for supporting said scoring roller, a universal joint connection between said housing and said bearing block so that the block may be angularly and lineally adjusted to bring the scoring roller into a predetermined position relative to the blank, and means for rotating the scoring roller in each adjusted position.

4. In a scoring machine, the combination of an anvil roller, a scoring roller adjacent said anvil roller for performing a scoring operation upon a blank as it passes between said rollers, a housing adjacent said rollers, a bearing block in said housing for supporting said scoring roller, a swivel plate having a convex surface mounted adjacent said bearing block, a seat plate having a concave surface to receive said swivel plate, block adjusting devices for rotating the block and the scoring roller carried therein in a direction parallel with the plane of the blank when between the rollers, swivel plate adjusting devices for rotating the block in a direction at an angle to the plane of the blank, seat plate adjusting devices for lineally shifting the block across the blank, clamping devices for securing the block in an adjusted position in said housing, and means for rotating the scoring roller in all adjusted positions of the block.

5. In a scoring machine, the combination of an anvil roller, a scoring roller adjacent said anvil roller for performing a scoring operation upon a blank when positioned between said rollers, a housing adjacent said rollers, a bearing block in said housing for supporting said scoring roller, a universal joint connection for said bearing block and providing means for adjusting the block angularly and lineally to bring the scoring roller into a predetermined position relative to the blank, and pivot means for retaining said bearing block in operative position relative to said universal joint connection, said pivot means being removable to allow the bearing block to be removed from and returned to said housing without disturbing the adjustment of the block.

6. In a machine for scoring blanks, the combination of a first operation scoring roller, a second operation scoring roller, a pair of spaced and parallel scoring edges formed upon and extending partially around the periphery of each of said rollers, the scoring edges on one of said rollers being longer than those on the other, means for feeding blanks past said rollers and into engagement with said scoring edges, means for rotating said rollers in timed relation to said feeding means whereby each pair of scoring edges operates in succession upon each blank to produce a single pair of parallel score lines thereon, and means for angularly adjusting the axis of one of said rollers relative to the blank being scored to vary the depth of cut of each cutting edge of the roller, whereby the score lines produced by said rollers may be of different and varying predetermined strength.

7. In a scoring machine, the combination of a pair of cooperating rollers, one of said rollers having a pair of spaced parallel scoring edges extending around its periphery and terminating adjacent a recess in the roller for producing parallel score lines partially across a blank passed between said rollers to leave an unscored portion in the blank, an insert disposed in said roller recess and having an auxiliary scoring edge forming a continuation and a closed end of said parallel scoring edges, said parallel scoring edges and said auxiliary scoring edge together producing a score cut terminating within the confines of said blank to set off a tearing strip shorter than the length of the blank, and means for rotating said rollers to produce said score cut.

8. In a scoring machine, the combination of devices for feeding a blank of sheet material along a predetermined path of travel, a first operation scoring roller disposed adjacent the path of travel of the blank and engaging against the blank for producing spaced parallel score cuts of predetermined depth extending partially across said blank and a terminating score cut section on said roller for joining together said spaced parallel score cuts within the confines of the blank, means for rotating said roller, a second operation scoring roller also disposed adjacent the path of travel of the blank and engaging the blank for re-scoring and increasing the depth of said spaced and parallel score cuts to leave the said terminating scored section of shallower depth and stronger than the re-scored portion of the score lines, and means for rotating said second operation scoring roller in time with the feeding of the blank to bring the re-scoring cut in the desired predetermined locality in the blank.

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