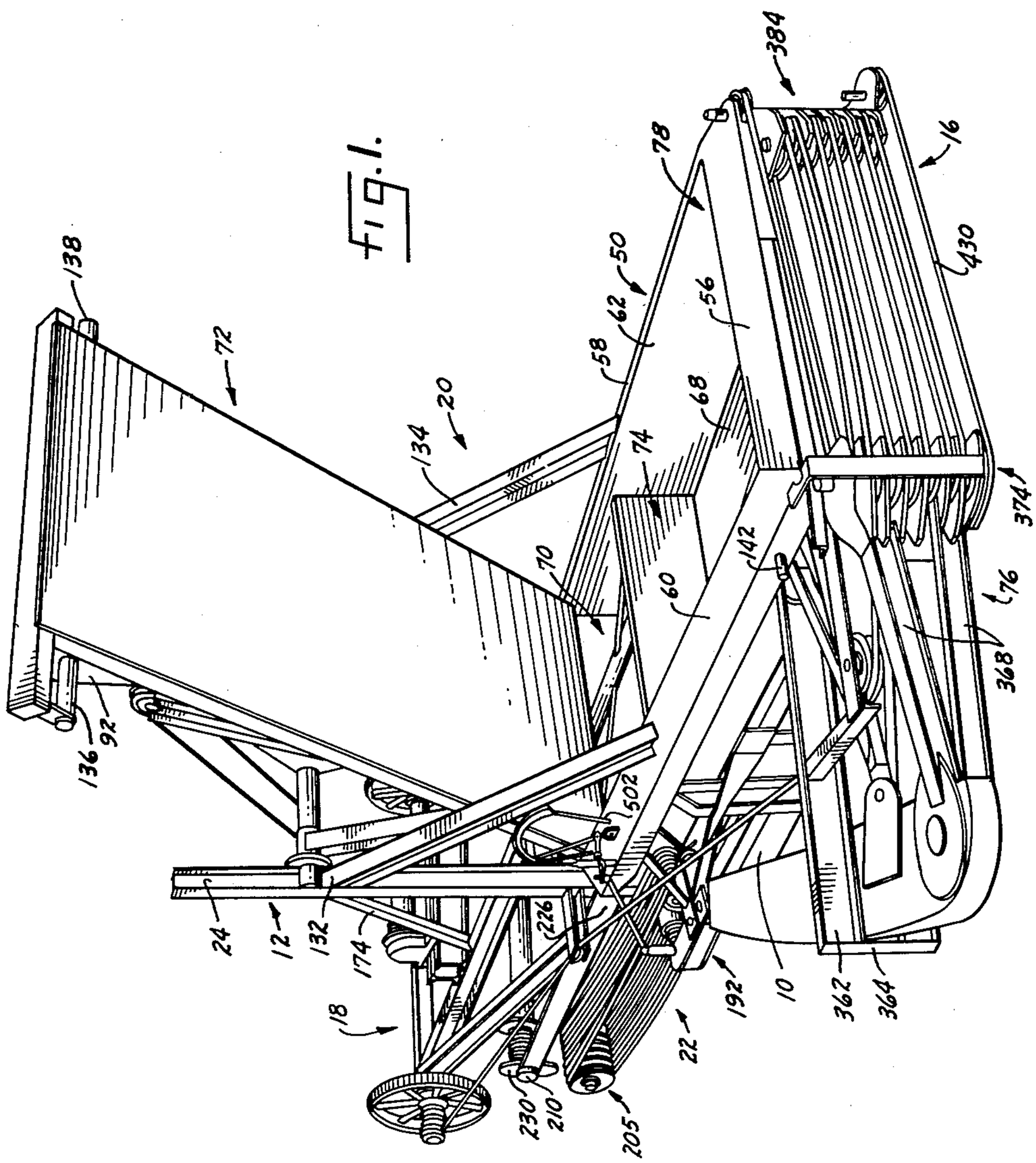
Sept. 20, 1960 G. R. EIDSON ET AL 2,953,084

METAL PRESS AND BALER

Filed Sept. 12, 1957 7 Sheets-Sheet 1

FIG. 1.



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METAL PRESS AND BALER

Filed Sept. 12, 1957 7 Sheets-Sheet 2

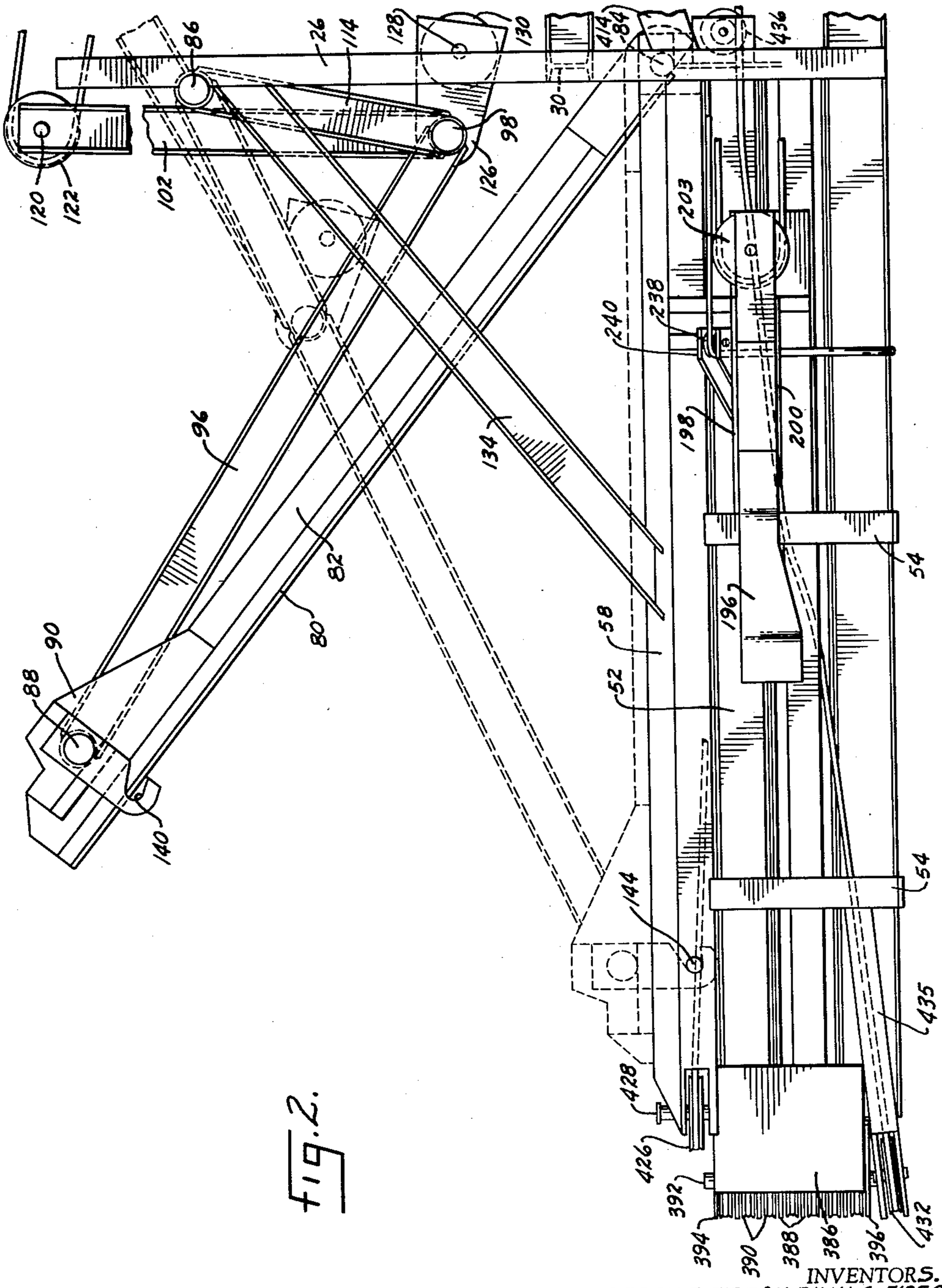

Fig. 2.

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METAL PRESS AND BALER

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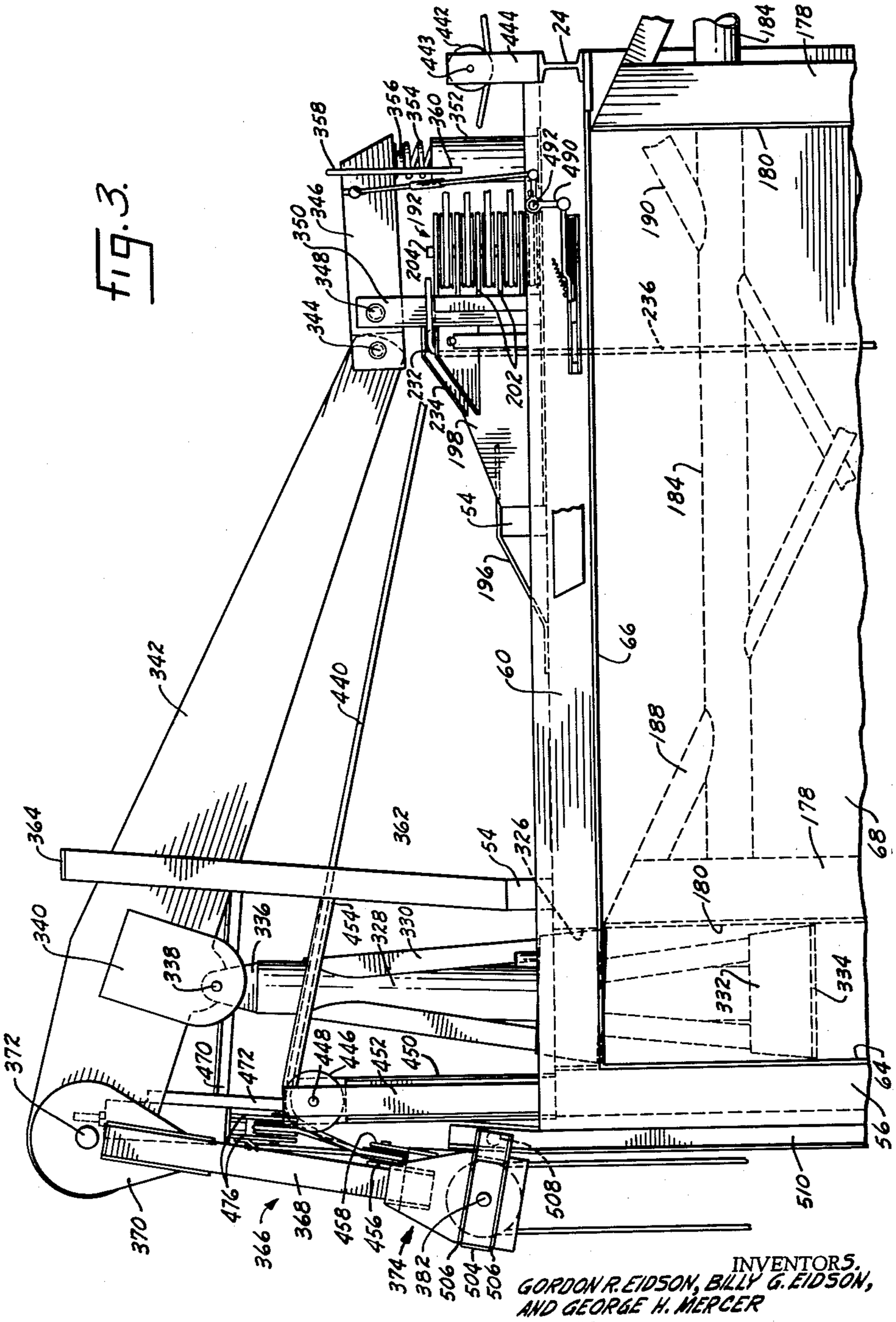
Fig. 3.



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METAL PRESS AND BALER

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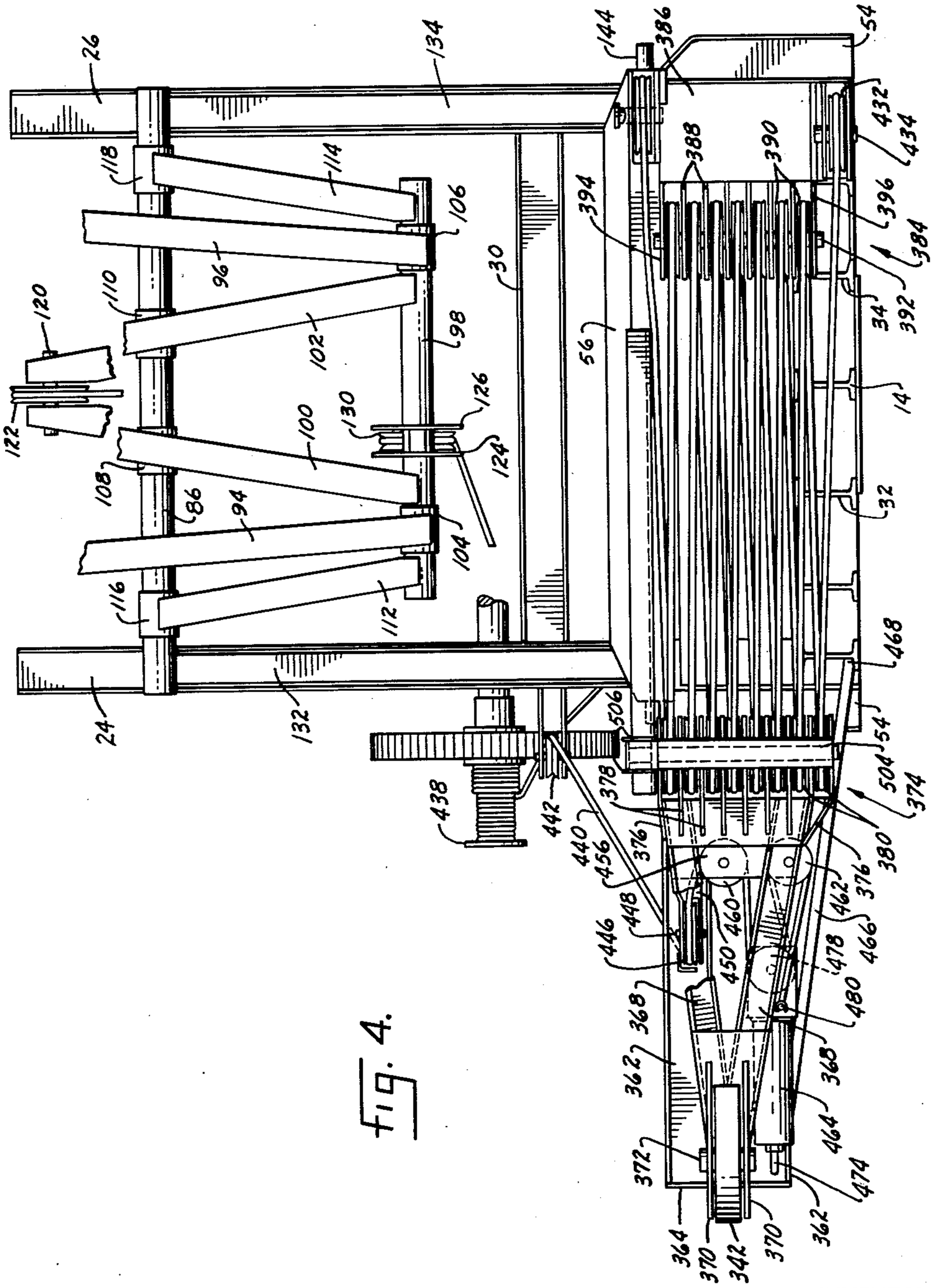

Fig. 4.

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METAL PRESS AND BALER

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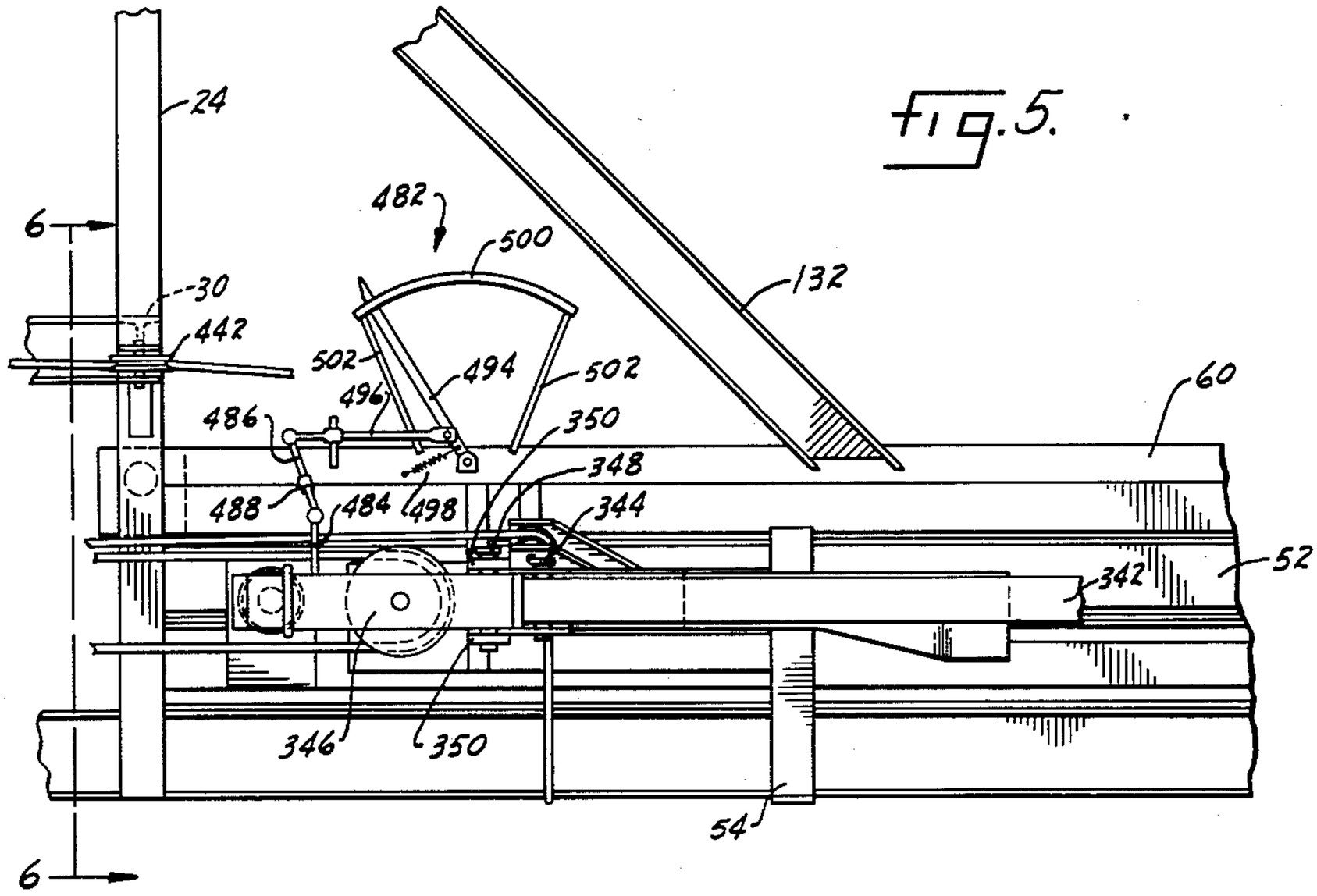

Fig. 5.

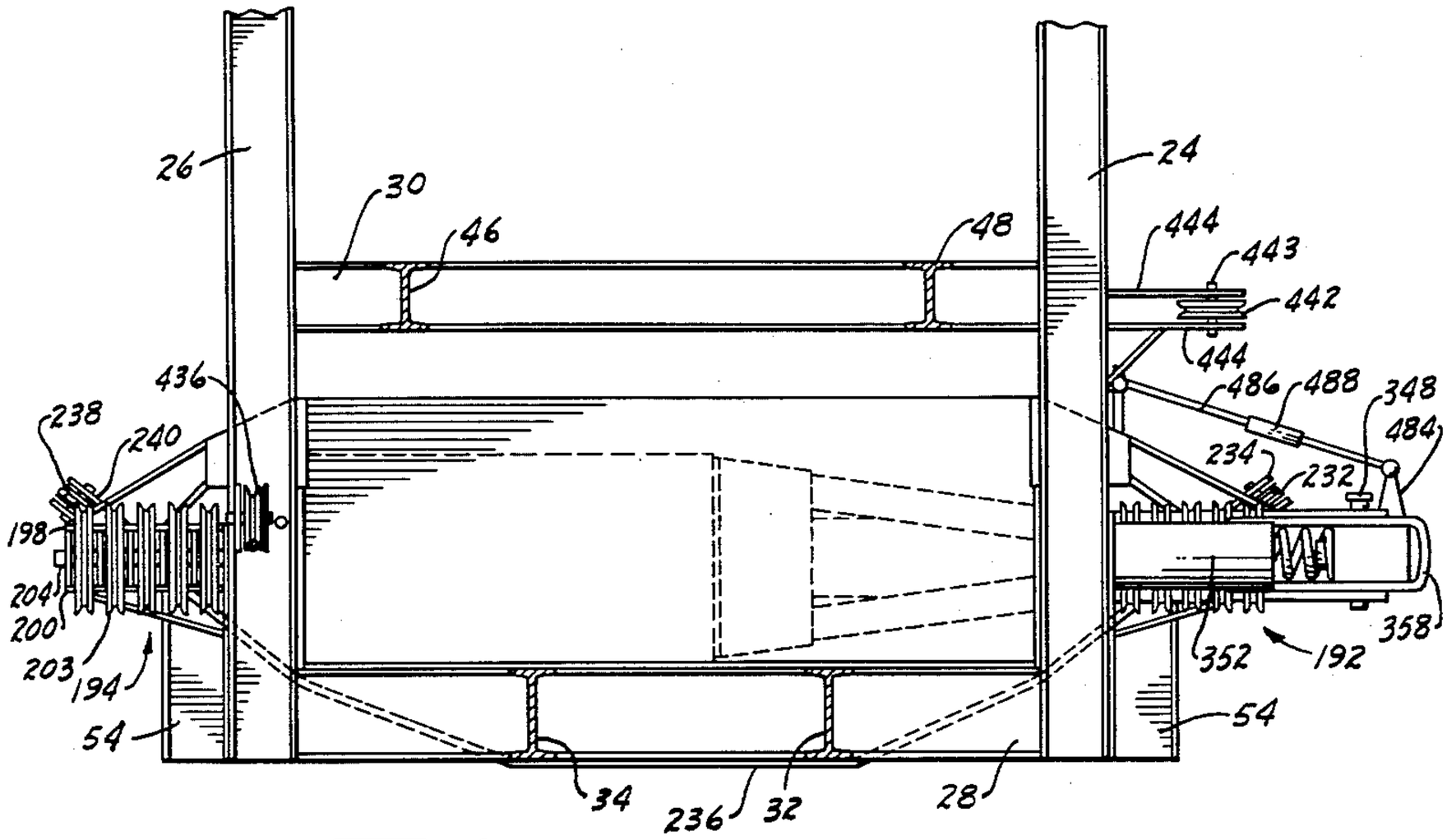

Fig. 6.

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METAL PRESS AND BALER

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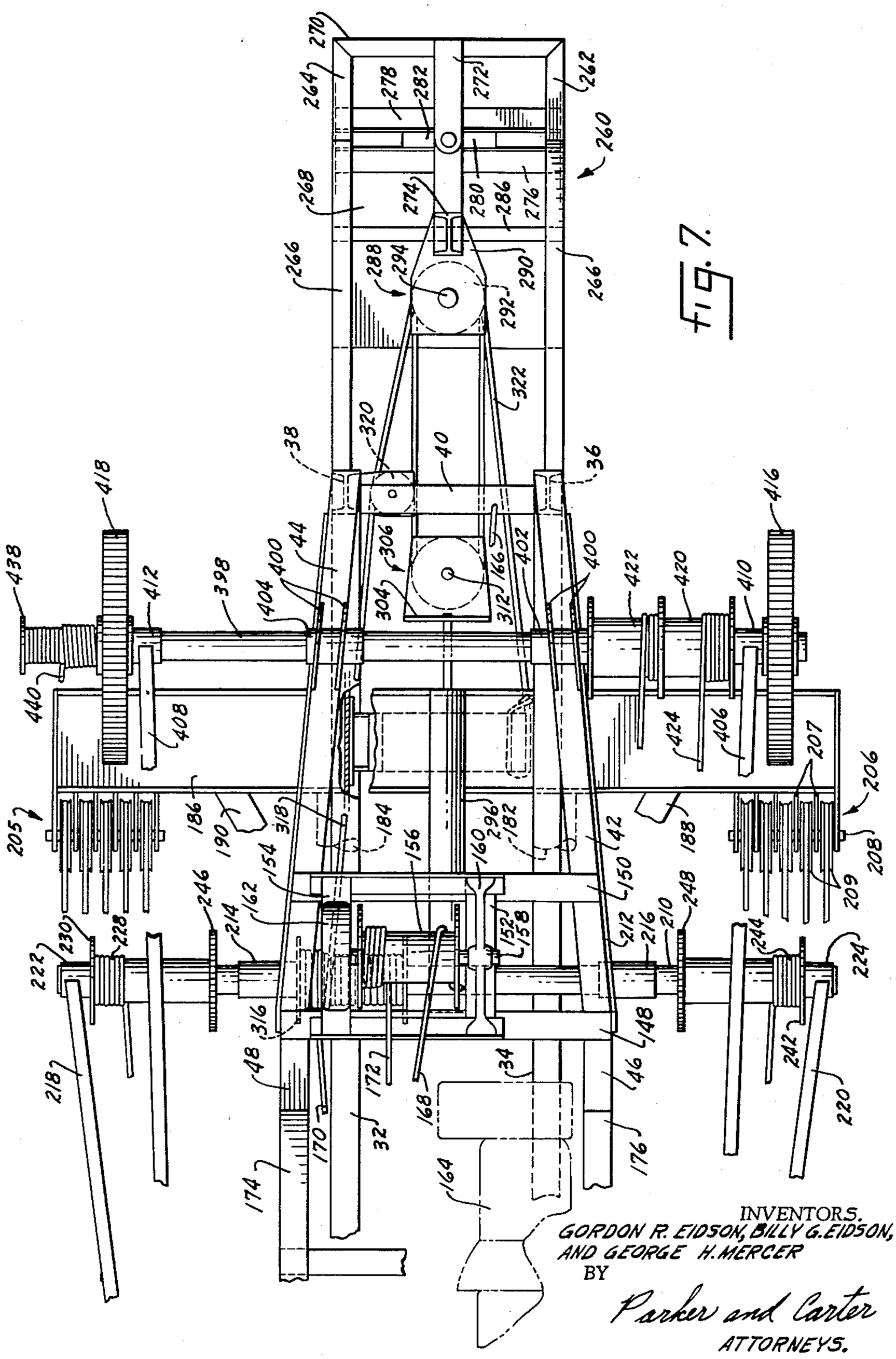

FIG. 7.

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METAL PRESS AND BALER

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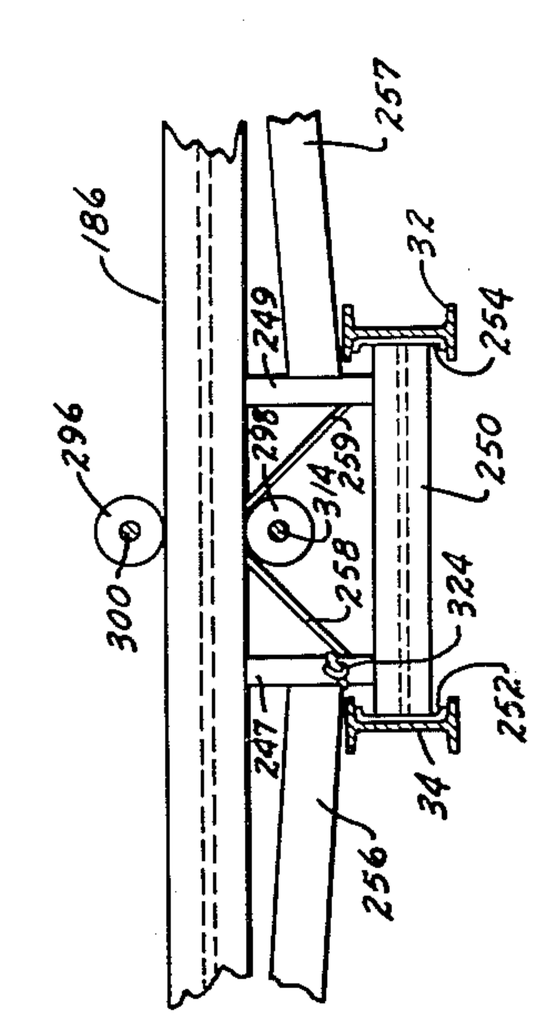

FIG. 9.

FIG. 8.

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United States Patent Office

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METAL PRESS AND BALER

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Filed Sept. 12, 1957, Ser. No. 686,270

4 Claims. (Cl. 100—232)

This invention is in the field of pressing machines for compressing scrap metal and the like into bales of a certain size for subsequent melting and is concerned with an inexpensive but highly reliable metal press.

A primary object of this invention is a new and improved metal press for taking scrap metal and compressing it into bales of a predetermined size and approximately constant weight.

Another object is a press of the above type which, for a given capacity on a time basis, is far less expensive to manufacture than anything previously known.

Another object is a metal press that will accept a full charge of metal at one time or at the same or a single loading and does not require a number of charges to produce a single bale.

Another object is a press of the above type that will automatically give a uniform size and weight of bale.

Another object is a press of the above type which requires a minimum of power to carry out a sequence of pressing operations.

Another object is a press of the above type which has an open top box or compression chamber which can be easily loaded, either manually or otherwise.

Another object is a press of the above type with three pressure or compression heads which operate in predetermined sequence to produce bales of a constant size.

Another object is a safety mechanism or structure for the pressure heads of a metal press of the above type to prevent the application of excessive pressures in any of the sequences of operation.

Another object is a drive mechanism for the pressure heads that avoids uneven operation in the event scrap metal is not uniformly distributed in the pressure chamber.

Another object is a metal press of the above type having an open top box type compression chamber and a pivoted upper lid with a unique actuating toggle mechanism.

Another object is a return mechanism for the various pressure heads in a metal press of the above type which insures positive but cushioned return movement of the pressure elements.

Another object is an indicating mechanism for one of the pressure elements on a press of the above type.

Another object is an eccentric or bar-mounting for one of the pressure heads which insures accurate and reliable operation.

Other objects will appear from time to time in the ensuing specification and drawings in which:

Figure 1 is a perspective of our metal press;

Figure 2 is a right side view of the front part of the press;

Figure 3 is a top view of the left front part of the press showing the small or side plunger or pressure head;

Figure 4 is a front view with several parts broken away or omitted for clarity;

Figure 5 is a left side view of the indicator mechanism;

Figure 6 is a section along line 6—6 of Figure 5;

Figure 7 is a top plan view of the rear of the press, with parts broken away for clarity;

Figure 8 is a right side view of the rear of the press, with parts broken away for clarity; and

Figure 9 is a section along line 9—9 of Figure 8.

In Figure 1, the press is shown as including a base designated generally **10** and an upstanding frame, designated generally **12**. As shown in Figure 4, the base may include a plurality of longitudinally disposed I-beams **14** or the like, shown as spaced generally equally and extending from the front of the base to a midship position as set forth hereinafter. In Figure 1, for convenience of description, the front of the machine is designated generally **16** while the rear is designated generally **18**. The right side of the machine shall be referred to as **20** and **22** as the left side. The beams **14** run from the front of the machine to a middle or midship position defined generally by a pair of upstanding posts or pillars, one on each side, **24** on the left and **26** on the right, in Figure 4.

As shown in Figure 6, a suitable lateral angle iron or I-beam **28**, in sections, may extend between the bottom of the posts **24** and **26** and a similar I-beam or the like **30**, in sections, may be suitably connected between the posts **24** and **26** a predetermined distance above the lateral beam **28**. Two of the base I-beams, designated **32** and **34** in Figures 1 and 4, extend behind the cross-beam **28** from front to rear of the machine as shown in Figure 8 and also in Figure 6. The lateral or cross-beam **28** may be in sections and suitably connected by welding or otherwise between the upright center posts **24** and **26** and the longitudinal main beams **32** and **34**.

At the rear of the machine, a pair of upright I-beams or the like **36** and **38**, shown in Figures 7 and 8, may be suitably connected to the main beams **32** and **34**, such as by welding or otherwise, extending upright, and connected across their upper end by a suitable brace **40**, shown in Figure 7. A pair of angle irons or the like, preferably I-beams, at **42** and **44**, which function as main upper beams or braces, extend forward from the upright beams **36** and **38** and the cross-beam **40** and diverge slightly as they move forward, such as is shown in Figure 7, and are suitably connected to a pair of longitudinal beams **46** and **48**, such as by welding or otherwise. The beams **46** and **48** extend forward and suitably connect to the lateral brace **30** in Figure 6.

Suitably mounted on the forward part of the base and formed as a part of the frame is what shall be referred to occasionally hereinafter as an open-topped box or compression chamber, indicated generally at **50** in Figure 1. This chamber may be made up of a plurality of longitudinally disposed I-beams or the like, designated **52**, along each side of the box, shown in Figures 2 and 5. These I-beams may be suitably connected at their rear ends, as by welding or otherwise, to the upstanding posts **24** and **26** and are interconnective along their length and suitably supported by a plurality of upstanding sill posts **54** on each side of the box. The front of the box or compression chamber may have a plurality of such laterally disposed I-beams. In Figures 2 and 5, we have shown three longitudinal I-beams on each side of the box. We may use three such I-beams across the front of the box but, for clarity, these have not been shown. The edges of these I-beams would be bevelled or abutted and suitably welded or otherwise connected to form the closed front end of the box. A plurality of diagonally disposed sill or rim plates, **56** for the front, **58** for the right side, and **60** for the left side, may be disposed around the upper edges of the box to suitably cover the I-beams and lower structural members.

The inside of the box may be lined with suitable armor

plate and we prefer to use 5/8 inch plate, although this is not critical. For example, in Figure 1, the right side of the box is lined with a sheet of armor plate designated **62** while in Figure 3 the front and left sides are lined iwth corresponding armor plate panels designated **64** and **66**, respectively. The armor plate may be suitably connected to the structural I-beams **52** along each side and those, not shown, across the front, by welding or otherwise, so that from time to time it may be removed and replaced when worn. Additionally, the deck or floor of the box may be provided with an armor plate sheet designated **68** in Figure 1 which may rest on the longitudinally disposed I-beams **14** in the base and **32** and **34** in Figure 4, for example. But we would prefer to connect the floor armor plate around the side, as by welding or the like, rather than to the base I-beams so that it may be easily removed and replaced.

It will thus be seen that on the base we provide an open-topped box which is closed on three sides, namely, the right, front, and left side, but is open in the rear and this opening is designated **70** in Figure 1. It is particularly important to note that the top portion of the box, as shown in Figure 1, is totally open so that the operator and his assistant may charge the box with scrap metal throughout its entire length.

To compress the scrap metal, we provide a plurality of pressure heads or compression units which may be referred to as plungers. The top pressure unit or lid, designated generally **72** in Figure 1, is approximately the same size as the open top of the box and is constructed to close it. The rear or main plunger or compression unit, designated generally **74** in Figure 1, is constructed to move in and out through the opening **70** in the rear of the box to compress the metal against the armor plate **64** on the front wall. The compression unit or small plunger, designated generally **76** in Figure 1, moves through a suitable opening, to be described hereinafter, in the left wall at the front, to compress the scrap metal against the armor plate **62** on the right side wall. Briefly, the sequence of operation is as follows: The entire unit is open, such as shown in Figure 1. After the box is charged with a suitable amount of scrap material, the machine is operated so that the lid **72** comes down and closes the open top of the box. Next, the main plunger **74** in the rear moves forward compressing the scrap material against the front wall of the box. When the main plunger **74** reaches a predetermined forward or extended position, shown in broken lines in Figure 3, the actuating mechanism for the side or small plunger moves the small plunger inwardly, as shown in broken lines in Figure 3, compressing the metal against the right side wall into the corner indicated generally at **78** in Figure 1. All of the plungers are then withdrawn, the lid is raised and the bale may be removed and either shipped or used immediately in a furnace, as the case may be.

Describing the details of the three compression members in the order of operation, we come first to the lid, shown in Figure 2, which may include a suitable sheath of armor plate **80**, 5/8 inch thick or the like, connected to a suitable frame designated generally **82**, preferably by welding so that it may be removed. The frame is pivoted, as at **84**, to each wall of the box and the pivots are located a predetermined distance above the floor or base so that the open rear end of the box is not obstructed. In Figure 1, the main plunger **74** is actually shown in a slightly extended position and it should be understood that during charging, the main plunger may be withdrawn so that its forward face merely fills or closes the opening **70** to complete the four-sided box.

The mechanism for raising and lowering the lid is primarily supported by the main posts **24** and **26** and is shown as including a support shaft **86** which is welded or otherwise suitably secured at each end to the posts **24** and **26**. This shaft is not necessarily rotated, but merely serves as a support. The details of this actuating mechanism will probably best be understood by observing primarily Figures 2 and 4. In Figure 4, the lid itself has been removed for clarity and only the connecting linkage and actuating mechanism is shown.

A header shaft **88** is also connected, by welding or otherwise, to a pair of upstanding plates suitably connected on each side of the forward edge of the lid, the right side plate being designated **90** in Figure 2 and the left side plate being designated **92** in Figure 1. The header shaft **88** extends between these two upstanding plates and accept a pair of forward links **94** and **96** which may be connected to the shaft by suitable bearings, not shown. A rock shaft **98** may be suitably connected, by welding or otherwise, to a rocker truss which includes two beams **100** and **102**. The forward links **94** and **96** may be connected to the rock shaft by suitable bearings **104** and **106**, in Figure 4, and the beams **100** and **102** which make up the rocker beam may be pivoted on the shaft **86** by suitable bearings **108**, **110**, shown in Figure 4. A pair of rear links **112** and **114** may be connected at their lower or forward ends, by welding or otherwise, to the rock shaft **98** and at their upper or rear ends by suitable bearings **116** and **118** on the main or support shaft **86**. The bearings that connect the forward end of the forward links **94** and **96** to the header shaft **88** at the forward edge of the lid may be the same as the various bearings shown in Figure 4.

The upper or rear ends of the beams **100** and **102** come together and carry a suitable pin or axle **120** for a suitable sheave or pulley **122**.

Thus, a linkage is provided between the forward edge of the lid and the support shaft **86** on the upright post, the forward link being composed of the beams **94** and **96** and the rear link being composed of the beams **112** and **114**. A rocker or actuating beam is effected by the beams **100** and **102** which are connected to the intermediate pivot shaft **98** between the two links and also connected between their ends to the support shaft **86** so that it can be rocked in either direction. The upper end of the rocker beam is provided with the sheave **122** for actuation by a cable and the lower end has a pair of spaced plates **124** and **126**, in Figure 4, which extend rearwardly as shown in Figure 2 and carry a suitable pin or axle **128** for a suitable sheave or pulley **130**. It will be understood that the plates **124** and **126** which, in effect, are a block for the pulleys are pivoted to the shaft **98** so that in any position the pulley may align itself rearwardly in the direction of its cable.

In Figure 1, when the lid is lowered, the forward links, **94** and **96**, and the rear links, **112** and **114**, straighten out, as shown in broken lines, drawing the lower sheave **130** forward and forcing the upper sheave **122** toward the rear. When the lid is to be opened, the cable around the sheave **130** is drawn rearwardly, which brings the pivot **98** between the two links down, shortening the distance between the main pivot **86** and the forward pivot **88** on the lid, thereby raising the lid. When the lid is to be lowered, the cable on the top sheave is drawn in and the cable on the bottom sheave is played out so that the linkage is straightened out.

During a pressing operation, tension is maintained on the cable on the upper sheave **122** so that the linkage will remain approximately straight, as shown in broken lines in Figure 2, thereby exerting pressure on the lid to keep the box closed. Substantial pressure will be developed in the box when the main and small plungers move in and we find it advantageous to mount suitable diagonal braces **132** on the left side and **134** on the right for strength. Additionally, the header shaft **88** at the forward edge of the lid may extend outwardly, such as shown at **136** and **138** in Figure 1, on each side of the lid and an auxiliary hook, shown at **140** in Figure 2, may be pivotally mounted on each such extension to be connected to a suitable pin or the like, shown at **142** on the left side of Figure 1, and **144** on the right in Figure 2. This will

firmly attach the forward edge of the lid to the box and will remove the majority of the strain on the pivoted linkage as well as the braces **132** and **134**. But it should be understood that under many circumstances, the auxiliary hooks **140** are not necessary.

The drive or actuating mechanism for raising and lowering the lid is designated generally at **146** in Figure 8 and includes forward and rear laterally disposed I-beams or the like, **148** and **150**, respectively, suitably connected to the beams **42** and **44**, such as shown in Figure 7. The lateral beams serve as a support for two longitudinally disposed, somewhat spaced beams **152** and **154**, shown in Figures 7 and 8, which function as a base for a winch or drum **156** having a suitable axle or the like **158** and side supports **160** and **162** mounted on the base. Power to rotate the winch may be obtained from a suitable engine, such as shown in broken lines at **164** in Figure 7. For example, it could be a gasoline or diesel or any other suitable type of engine. We have not shown the drive or transmission between the engine and the various power shafts, including the winch mechanism **146**, as it will be understood that this may be accomplished by chains, gears, shafts or otherwise. The important point is that a suitable power source, be it an engine or otherwise, may be positioned in a generally central location designated **164** to drive the winch **156** and the other hereinafter described power shafts.

Two cables come to the drum or winch **156**, one running to the upper sheave **122** on the rocker beam and the other running to the lower sheave **130**. The top throw **166** of the upper cable for the upper sheave **122** may be dead ended or suitably connected to the frame, such as to the lateral beam **40** in Figure 7, while the bottom throw **168** is connected to and wrapped around the winch **156**. The bottom cable leading to the bottom sheave **130** for the rocker beam has its lower or bottom throw **170** dead ended to a suitable part of the frame, such as the lateral beam **148** in Figure 8, and the top throw **172** is connected to and wrapped around the winch **156**. The bottom throw for the top cable and the top throw for the bottom cable are wrapped around the winch in opposite directions. Therefore, rotation of the winch in one direction will play out one cable and take in the other and vice versa.

Therefore, if the lid is closed, and the winch is rotated so that the top throw **172** of the bottom cable is reeled in, the lower sheave **130** will be drawn toward the rear which will break and jack knife the linkage, thereby raising the lid. At the same time, the bottom throw **168** of the top cable will be played out allowing the top sheave **122** in Figure 2 to move forward as the rocker beam pivots.

When the lid is to be closed, the winch is rotated in the opposite direction. This takes in the bottom throw **168** for the top cable and plays out the top throw **172** of the bottom cable. The combination tends to rotate the rocker beam clockwise about the pivot **86** in Figure 2, whereby straightening out the links **94** and **96** and **112** and **114**, closing the lid.

In addition to the forward braces **132** and **134** between the upright posts **24** and **26**, we may also use rear braces, such as at **174** for the left side and **176** for the right, each being suitable connected as by welding or otherwise to the longitudinally disposed rear braces or beams **46** or **48**.

The main plunger, such as probably shown best in Figures 3, 7 and 8, may include a forward pressure member or head **178** having a suitable ⅝ inch armor plate surface **180** connected by welding or otherwise so that it may be removed and replaced when worn. A pair of spaced main longitudinal strength members, in the form of pipes or otherwise, designated **182** and **184**, extend from the head **178** to a rear header beam **186**. Diagonal braces **188** and **190** that cross each other may extend between the forward pressure head **178** and the rear beam **186**. This structure may all be suitably connected by welding or otherwise.

On each side of the box, just forward of the upright posts **24** and **26**, a fixed block may be mounted, such as indicated at **192** and **194** in Figures 1, 3 and 6. In Figure 3, each block may have a forward brace **196** connected at one end by welding or otherwise to the side of the box and at its other end to a pair of spaced plates **198** and **200**, shown in Figure 2, which are suitably connected to the side of the box. The plurality of spacer plates **202**, disposed generally vertically, as shown in Figure 3, are connected at their forward edge between the spaced plates **198** and **200** and a suitable pin or axle **204** extends through these plates to function as a pivot for a group of sheaves, designated **203**. The inner end of the pin **204** may project into the housing and be supported by a suitable bearing, not shown. The forward edge of the spaced plates **198** and **200** may abut against one of the sill posts **54**, which functions as an anchor for them and the brace **196** also overlaps this post.

Thus, the sheaves in the stationary blocks on each side are freely rotatable but are stationarily and rigidly mounted on the sides of the box or frame.

The main rear beam **186** in Figure 7 of the main plunger carries movable blocks designated generally at **205** and **206** at each end which are mounted on the forward face of the beam. Each such block may include a plurality of spaced plates **207** with a laterally disposed pin or axle **208** for a plurality of sheaves **209**. It should be noted that the beams project laterally beyond each side of the frame and the movable blocks **205** and **206** generally oppose the fixed blocks **192** and **194**, such as shown generally for the left side paired blocks in Figure 1.

The drive for the blocks of the main plunger includes what we shall refer to as the main drive shaft **210** which may be carried by suitable plates **212**, shown in Figure 8, as mounted on each side below the longitudinal main beams **42** and **44** running back to the upright posts **36** and **38**. One such plate **212** is positioned on each side, and the auxiliary main drive shaft may be provided with suitable bearings **214** and **216**, as shown in Figure 7. In view of the stresses placed on the shaft, it may be suitably braced by a pair of braces **218** and **220** provided with suitable bearings **222** and **224** with the forward end of the braces anchored on the side of the box, as shown at **226** in Figure 1.

The main drive shaft **210** may be rotated in either direction and is suitably geared or otherwise connected to the power source which may take the form of the engine, indicated at **164**. Again, this may be done by either chains, gears or what have you. The important point is that through a suitable transmission, power may go to the winch **156** for raising or lowering the lid and then to the main drive shaft for actuating the main plunger.

A single take-up cable is used for both sets of blocks. This is to say that the take-up cable shown around the movable blocks **205** in Figure 7 is the same cable as that shown around the movable blocks **206** on the other side of the frame. One end of the cable, as at **228**, is connected to a suitable drum **230** on the left end of the main drive shaft that extends out beyond the side of the frame. From this drum **228**, the cable extends forward to the left side stationary block **192** shown in Figure 3. Then the take-up cable passes back and forth over the various sheaves and after passing over the last sheave on the movable blocks **205**, it is lead forward over a diagonal guide pulley **232**, shown as disposed at approximately 45°, on a suitable mounting **234**. The cable then is directed laterally, as shown in broken lines at **236** in Figure 6, across and under the frame. The section **236** of the cable moving laterally across the machine merely passes under the longitudinal I-beams of the base and then rises on the other side to a corresponding diagonally

disposed guide or sheave **238** having a suitable mounting **240** which may include plates or the like mounted on the plate **198** which serves as a part of the mounting for the right side fixed block of sheaves. The take-up cable then moves rearwardly and passes around the sheaves of the fixed and movable blocks for the right side, **194** and **206**, respectively, and then is wrapped around a drum or spool **242** on the right side extension of the main drive shaft **210**. Thus, the other end **244** of the cable is attached to the other end of the drive shaft. It should be noted that the respective ends **228** and **244** of the take-up cable are wound about the spools on each end of the main drive shaft in the same direction such that when the drive shaft is rotated, both ends of the cable will be either played out or taken up together.

As set forth hereinabove, the main drive shaft may be actuated through any suitable mechanical train running from the above described power means, such as a motor or the like, and we have shown generally a pair of sprockets **246** and **248**, one on each side, adjacent the spools or drums, which may be driven each by a suitable chain running to the main drive shaft from the power source. But, for purposes of clarity, we have not gone into the particular power transmitting means used. Suffice it to say that any suitable means could be employed.

It should, therefore, be seen that when the main drive shaft is actuated, both ends of the take-up cable will be reeled in at the same time. This draws the movable blocks forward toward the stationary blocks and the rear part of the main or big plunger will be drawn forward moving the compression face along the floor of the box toward the front wall. Since both ends of the cable are being reeled in, the middle section of the cable, designated generally **236** in Figure 6, will remain stationary and, in effect, this is the dead end for both sides of the cable. But, if the scrap metal in the box is unevenly distributed for one reason or another, and the majority of the compressing action is taking place on one side of the box or the other, the main plunger will have a tendency to slip sidewise or cant in the compression box. Also, for example, if the take-up cable were to wrap double on one of the spools or drums and not on the other, the entire load would be taken by one side. But since only one cable is used, it will equalize because the section **236** will be shifted toward one side or the other. In other words, the drives on both sides are tied together so that if one cable doubles up, the slack from the other side will be shifted across through the intermediate section **236**.

To prevent the main plunger from canting sideways or jamming in the box when it is unevenly loaded with scrap metal, the rear portion of the main plunger is provided with a guide mechanism, such as shown in Figure 9, which takes the form of a pair of posts **247** and **249**, suitably connected as by welding, to the rear main beam **186** of the main plunger. These posts have an I-beam or the like **250** connected across their lower ends, and the ends of the I-beam are provided with slides **252** and **254** which fit against the inside of the main longitudinal beams **32** and **34**. Diagonal braces **256** and **257** may be disposed between the vertical posts **247** and **249** and connected at their upper ends at the outer extremities of the main rear beam **186** for strength and rigidity. Also, inner braces **258** and **259** may be used, if desired.

Thus, the rear end of the main plunger has a frame that extends down between the main longitudinal beams **32** and **34** of the base of the machine. If the majority of the compression or crushing action is taking place on one side of the box, the slide arrangement between the main longitudinal beams **32** and **34** of the base will prevent the rear end of the main plunger from swinging to the opposite side. Thus, the load at all times will be evenly distributed and excessive compression will not be applied to either side of the main cable.

For the main plunger thus far, we have described the mechanism whereby the plunger is moved forward to compress the scrap metal in the box. We now describe the structure whereby, after a pressing or compression operation, the main plunger is pulled back or returned to the starting position so that the box may be again charged with scrap metal.

As shown in Figures 7 and 8, a tail section, designated generally **260**, may be mounted on the rear of the machine and may include a pair of spaced, longitudinally disposed I-beams **262** and **264** or the like extending rearwardly from the uprights **36** and **38**, each of which may be suitably braced as by a diagonal **266** on each side. A plate **268** may be disposed under the main members **262** and **264** and a suitable channel **270** may be connected across the rear end. A suitable brace **272** may be connected at its rear end to the tail channel **270** and extends forward to a vertical post **274**. Angles **276** and **278** extend laterally across the tailpiece and are connected to the longitudinal I-beams **262** and **264** by welding or otherwise. Suitable blocks **280** and **282** may be secured, as by welding or otherwise, between the angles to form a support and guide for a suitable kingpin **284** which may be used in transporting the press, as explained hereinafter. A cross brace **286** may be disposed through the upright post **274** and secured to the longitudinal members **262** and **264** by welding or otherwise.

A fixed block, designated generally **288**, may be mounted on the upright post **274** and may include a plurality of spaced plates **290** separating a plurality of sheaves **292**, shown in this case as five in number, although it might be more or less. A suitable axle or pivot **294** is disposed through the plates and sheaves.

A pair of spring housings or casings **296** and **298**, one above and the other below, are mounted on the main rear beam **186** for the big plunger. As shown in Figure 8, each casing may include a rod **300** extending into the casing and surrounded by a suitable coil spring **302** with the rear end of the rod connected to a plate **304** that carries a movable block **306** with a plurality of sheaves **308** separated by plates **310** and rotatably mounted on a suitable pin or axle **312**. It will be noted that the upper rod **300** is connected to the top center of the plate **304** while the lower rod **314** is connected to the bottom center of the plate. Each of the spring casings **296** and **298** is suitably connected to the main rear beam **186** of the main plunger and, as shown in Figure 8, the springs are partially compressed. Figure 8, in fact, shows a return operation during which the main plunger is being drawn rearwardly.

As shown in Figure 7, the main drive shaft carries a drum or spool **316**, generally in the center and within the frame, and a return cable **318** is wrapped around this spool and extends rearwardly through a guide pulley **320** suitably mounted on the upright post **38** to the top sheave of the fixed block **288** on the tailpiece. The return cable then passes about the sheaves of the fixed and movable blocks and comes off of the last sheave on the fixed block, at **322** in Figure 7, and is dead ended in any suitable manner, as at **324**, to the upright beam **246** which is a part of the lower frame on the main rear beam **186** of the main plunger. The return cable **318** is wrapped around the spool **316** in such a manner that when the main drive shaft is rotated to play out the take-up cable, the return cable will be wound on the spool **316** and through the fixed and movable blocks **288** and **306**, the main plunger will be drawn rearwardly. The resilient connection including the springs **302** is such that a lost motion type transaction takes place in the event that the main plunger sticks or otherwise becomes clogged or jammed. The dimensioning of the parts is such that the take-up cable on the drums **230** and **242** will be played out or taken up evenly at the same time that the return cable **318** is played out or taken up on the spool or drum **316**.

The structure and operation of the small or side plunger **76** will now be described.

The armor plate **66** on the left wall of the box has a suitable opening, designated generally at **326** in Figure 3. This opening may be square and located generally at the left-hand corner of the box in the side wall. The side plunger itself includes a main body member **328** and a plurality of braces or angles **330**, one for each corner, extending to a presser head **332** which may be lined on its forward face with a square piece of armor plate **334** which is of such a size and shape that it fits evenly through the opening **326** in the side wall. The rear of the body element is provided with a pivot piece **336** which, through a suitable pivot pin **338**, is connected to a pair of plates **340** which straddle and are suitably welded or otherwise connected to each side of a main arm member **342**.

The arm member **342** is pivoted at **344** in any suitable manner to a rocker element **346** which in turn is pivoted in any suitable manner at **348** to a suitable strap type brace **350** or the like which is welded or otherwise suitably connected to the side of the box or frame. In effect, the brace is a firm mounting for the rocker element **346**. A spring barrel **352** is suitably connected, as by welding or otherwise, to the side of the housing and extends outwardly. A compression spring **354**, preferably a coil spring, is contained in the barrel and engages a guide or projection **356** at the rear end of the rocker **346**. A suitable U-bolt or strap **358** with its inner ends, as at **360**, suitably connected to the barrel **352**, as by welding or otherwise, surrounds the rear end of the rocker **346** to define its extreme outward position. It should be understood that when the parts are in their inoperative position, the spring **354** will force the rocker **346** outwardly until it contacts the end of the U-bolt.

A suitable guide or support mechanism which may include two I-beams **362** in Figures 1 and 3 connected to the side of the frame and projecting outwardly, one above and the other below the arm **342**, may be used to support the arm during its operation and a suitable strap **364** may be welded or otherwise secured across the outer ends of the guide members **362**.

An actuating mechanism, indicated generally at **366**, is provided for drawing the side or small plunger inwardly to a fully extended position and outwardly to its fully withdrawn position. As shown, the structure includes a pair of I-beams **368** or the like suitably connected by welding or otherwise at their rear ends to plates **370** which are pivoted by a suitable pin **372** to the forward end of the arm **342**. A movable block **374** is carried at the forward end of the beams **368** and may include mounting plates **376**, shown in Figure 4, on both top and bottom and a plurality of separator plates **378** with interposed sheaves **380**. A suitable pin **382** or the like may be supported by the plates to function as an axle or pivot for the sheaves. The right front corner of the box carries a fixed block of sheaves, designated generally at **384** in Figure 1 and shown more in detail in Figure 4. A corner plate **386** may function as a partial support for a plurality of spaced plates **388** which separate a plurality of any given number of spaced sheaves **390** which may suitably be supported on a pivot pin **392** extending between top and bottom plates **394** and **396**, respectively. For the movable and fixed blocks **374**, and **384**, we have shown eight and seven sheaves, respectively, but it might be otherwise, depending on the size and capacity of the unit.

The drive mechanism for the side plunger is shown generally in Figures 7 and 8. An auxiliary drive shaft **398** is mounted on suitable supports **400** on the frame members **42** and **44** by suitable bearings **402** and **404** or the like. Braces, as at **406** and **408**, may be connected to suitable bearings **410** and **412** adjacent each end, and these braces may extend forward to a suitable anchoring position on a main frame, for example, against the main upright posts **24** and **26** as indicated at **414** in

Figure 2. Thus, the thrust will be taken by the main frame of the machine and not by the supporting pieces **400**. The drive for the auxiliary drive shaft **398** may be effected by any suitable means from the power source **164** and, as shown, suitable gearing, such as at **416** and **418**, may be used, although it should be understood that any suitable means, such as chains or the like, may be employed. For purposes of clarity, the particular drive employed has not been shown.

A pair of spools or drums, designated **420** and **422** in Figure 7, may be disposed side by side on the right end of the auxiliary drive shaft. A take-up cable **424** is wrapped in the same direction around each of the spools or drums and is suitably connected thereto. This cable runs to and around the fixed block **384** and the movable block **374** for the small or side plunger. The cable from the inner spool **422** is led along the frame, under the cover plate **58**, to a fixed guide pulley or sheave **426** in a notch or groove mounted on a suitable pin or pivot **428** at the right corner of the frame. The cable then extends across the front of the unit to the top sheave of the movable block and then passes back and forth between the sheaves of the movable block and the fixed block. The takeup cable comes around the bottom sheave of the movable block, and moves across the front of the machine, as at **430** in Figure 1, and then around a fixed guide pulley **432** at the bottom of the right corner of the machine mounted on a suitable pivot pin **434**. The cable, as shown in Figure 2, then moves rearwardly through a suitable collection of guides at **435**, channels and passages through a second guide pulley **436** to the outer drum or spool **420** on the auxiliary drive shaft. It should be noted in Figure 7 that both ends of the cable are wound in the same direction on the spools or drums so that when the auxiliary drive shaft is rotated in either one direction or the other, both ends of the take-up cable will be either taken in or played out at the same time.

The above described mechanism closes or extends the small plunger or side unit into the box, as shown in broken lines in Figure 3, to compress the scrap metal after the main or big plunger has been moved forward to its fully extended position. The hereinafter described mechanism operates to return the small plunger to its fully withdrawn position, such as shown in full lines in Figure 3, so that the box or compression chamber may again be charged with scrap metal.

One end of the auxiliary drive shaft **398** extends outward beyond the side of the frame on the left side and includes a spool or drum **438**, shown in Figures 4 and 7, around which is wound one end of a return cable **440** for the small or side plunger. The cable runs forward along the left side of the machine to a guide pulley or sheave **442** mounted on a pivot **443** between suitable bracket plates **444**, mounted by welding or otherwise on the upright main post **24**, shown in Figures 1, 3 and 4. The cable then extends to a sheave **446** which is rotatably mounted on a suitable pin **448** held on a side plate or strap **450** which may be connected to the side of the frame in any suitable manner. A top plate **452** may carry the top of the pivot and may extend to and abut the top brace **362**.

Both the top and bottom plates or braces **450** and **452** may be suitably connected by welding or otherwise at the sides of the box so that the sheave **446** will be rigid. In Figure 3, the top plate or brace **452** is not shown as extending to the arm brace or support **362** and we have reduced it so that the small plunger **328** will be visible. We have shown a guide **454** which extends from the top brace **362** to the brace **452** and the cable **440** may extend through it.

Attached to the inside of the movable block **374** that actuates the small plunger may be a pair of spaced plates **456** and **458**, as shown in Figure 3, which, as shown in Figure 4, may extend approximately the full

height of the movable block of sheaves. Two sheaves are mounted on suitable pivots between these two plates, the top one being designated **460** and the bottom one **462**. Both of these sheaves move with the movable block **374** and as will be seen in Figure 4, the return cable **440**, after passing around the fixed sheave or guide pulley **446**, then passes around the top sheave **460**.

A spring barrel **464**, shown in Figure 4, may enclose a suitable coil spring, similar to the one, for example, shown in Figure 8 at **302**. The barrel is braced by a suitable channel or strap **466** which abuts one of the longitudinal I-beams for the base as at **468**. The other end may be suitably connected by welding or otherwise to the barrel, and additionally a side brace **470**, shown in Figure 3, may be connected between the side of the barrel or spring housing **464** and the lower guide **362** supporting the main arm **342**. An additional brace **472**, shown in Figure 3, may run from the side of the barrel to the side of the main compression chamber or box, but it should be understood that any suitable bracing may be used. The point is that the barrel **464** is held in a stationary position and is suitably braced against the side of the box.

The rod **474** in the barrel passing through the coil spring may be connected between a pair of plates **476**, shown in Figure 3, and a sheave or pulley **478** is rotatably mounted on a suitable pin or axle. The return cable **440**, after passing around the upper sheave **460** on the block, shown in Figure 4, may then pass around the sheave **478**. From this sheave it extends to the lower sheave **462** mounted on the movable block **374** and then returns to a dead end **480**, shown in Figure 4, on the side of one of the plates **476**.

The return cable **440** is wrapped around the drum or spool **438** on the left end of the auxiliary drive shaft in the opposite direction from the two ends of the take-up cable **424** for closing the small plunger. Thus, when the drive shaft is rotated in one direction to close the small plunger, the take-up cable **424** will be taken up or reeled in by its drums or spools **420** and **422** and at the same time the return cable **440** will be played out. During a return movement when the plunger is to be moved back or opened, the return cable **440** will be reeled in while the take-up cable **424** will be played out. The dimensioning is such that slack is not created in either cable and they are maintained relatively taut during movement.

In Figures 3 and 4, when the auxiliary drive shaft is being rotated in a direction to take in the return cable **440**, the spring barrel mounting **464** and the sheave or pulley **478** provide a resilient connection so that if any jamming or stoppage occurs, a lost motion connection is provided to prevent damage. Additionally, the use of the two sheaves **460** and **462** on the movable blocks with the fixed sheave **478** on the brace attached to the frame provides the necessary mechanical advantage for pulling the relatively heavy small plunger back to the open position.

As shown in Figures 1, 3, 5 and 6, we provide an indicator mechanism, designated generally **482**, in Figure 5, to indicate to the operator when the small plunger has reached its fully extended position. This indicator includes a post or the like **484** fixed to the rocker element **346** and connected to a link **486** having a suitable adjusting turnbuckle **488** or the like. The link is connected to a suitable bell crank **490** which is pivoted on the frame at **492** and is connected at its other end to an indicator arm **494** through a suitable link **496**. A suitable spring **498** tends to return the indicator arm **494** to the left side of a suitable scale **500** which is mounted on the side of the box by legs **502**.

When the actuating mechanism through the take-up cable **424** (as shown in Figure 7) closes the small plunger thereby pivoting the arm **342** counterclockwise in Figure 3, the face of the small plunger will be brought in contact with the scrap metal in the trough between the front of the box and the face of the main plunger, as shown in broken lines in Figure 3. Tension is applied through the main elements **368** of the actuating mechanism and when the small plunger comes in contact with the scrap material, the arm **342**, while initially a straight pivot, becomes a rocker arm and tends to pivot counterclockwise about the pivot point **338**. This pivots the rocker **346** clockwise about the pivot **348** which, through the link **486**, rotates the bell crank **490** clockwise in Figure 3 to move the indicator **494** from left to right in Figure 5.

During return movement of the small plunger when it is being drawn back by the return cable **440**, the movement of the various elements is reversed and the indicator arm **494** will be moved from right to left in Figure 5.

As the small side plunger is disposed generally in a horizontal position, we provide a support for it which includes a side strap **504**, shown in Figures 1 and 4, mounted along the side of the movable block **374**. This strap has a pair of angle truss plates **506** on top extending across the pivot pin **382** of the sheaves to a slide pin **508**. An angle iron **510** or the like, shown in Figures 1, 3 and 4, is suitably connected by welding or otherwise along the front of the compression chamber or box and the pin **508** fits inside of the angle.

Thus, when the small plunger is closed or opened, the pin riding inside of the angle will serve as the support for the forward part, which includes the movable block **374**. Normally, during a compression movement where the small plunger is moving into the box, sufficient tension is applied through the take-up cable **424** so that the support is not necessary. During return movement when the small plunger is being drawn back to the position shown in full lines in Figure 3, the movable block **374** has a tendency to drag and this support is very desirable to prevent the outer end of the arm **368** and the movable block **374** from dragging along the base or the ground.

The use, operation and function of our invention are as follows:

The disclosed machine is quite inexpensive but at the same time highly reliable in operation. The unit primarily consists of a base, a frame on that base, the frame including an open top box having three closed sides and an open fourth side. A compression lid is pivoted to the box at a point at the top of the side walls straddling the open fourth side, but not interfering with the movement of a main plunger. The main plunger itself is constructed to slide along the floor of the box from a rear or fully withdrawn position where it closes the open fourth side to a fully extended position, such as shown in Figure 3, where it defines a lateral compression trough with the front wall of the box.

The small or side plunger projects through a suitable opening in the left front corner in the side wall of the box and is constructed to be moved in along the front wall of the box between the front wall and the front face of the large plunger to compress the material through the lateral compression trough defined by the large plunger into a final compression space in the right corner at the front wall.

The lid or cover may be raised or lowered and the linkage mechanism shown and described insures a positive action, both for maintaining the lid in the raised position shown in Figure 1 or for holding it in its closed position and resisting the compressive forces effected by the small and main plungers, such as shown in Figure 2. The drive for the lid is simple but highly reliable and insures a positive fast movement.

The drive for the main plunger insures uniform compression across the entire lateral face of the plunger. At no time can the plunger shift or cant within the box during its compression stroke. The tail of the plunger is carried in a suitable slide between two of the main frame I-beams so that it cannot shift from one side to another if the majority of the scrap metal happens to be

located on one side of the box. Additionally, the main plunger is pulled forward by a double block and tackle mechanism, one on each side, which, in reality, function as a unit since they are tied together by a unitary take-up cable.

If, for any reason, the majority of the load tends to be applied to one side, the intermediate section of the cable will automatically shift, thereby equalizing the load. It should be noted that this is done automatically and does not require any operator's supervision. The return mechanism for the large plunger has a resilient connection between it and the frame. During the return movement of the main plunger, the return cable only has the weight of the main plunger and its frictional drag to overcome, and this resilient connection insures a uniform safe return movement and prevents excessive loads from being applied to the return cable.

The small plunger or compression head moves in from the side and has a double pivoting arrangement to insure operation, first, of an indicator, and, second, of the main plunger itself. The small plunger cannot stick or jam in the compression trough defined between the front of the box and the forward face of the main plunger. Additionally, its return movement prevents an excessive strain or load from being placed on the return cable due to the resilient connection shown generally in Figure 4.

We have shown the auxiliary hooks for holding the lid down in Figure 2, but in certain units these may not be necessary.

Another point to be noted is that the main cross rear beam **168** for the main plunger will contact the main upright middle posts or pillars **24** and **26** on the frame when the main plunger is in its fully extended or forward position, shown in broken lines in Figure 3. Thus, the width of the lateral compression trough defined between the front of the box and the forward face of the main plunger is automatically established and will not vary. This insures, first, that the main plunger does not overlap the side plunger to prevent its entrance and, second, that it is not spaced away from it allowing material to slip between the two.

In our present unit, the compression chamber or box is 2 feet deep, approximately, 12 feet long from front to rear, and 5 feet 4 inches from side to side, these all being inside dimensions. A bale of compressed metal produced by the unit measures 18 inches by 36 inches by 21 inches and will weigh on the order of from 325 to 440 pounds, depending upon the consistency of the material charged into the box. We find that we can produce one bale in less than four minutes, which will give a daily production of at least 130 bales in a 12 hour period or, assuming an average bale weight of 400 pounds, 26 tons in a 12 hour period. We may safely say that the unit will produce on the order of 3 tons of baled scrap metal in an hour.

While we have shown and described the preferred form and suggested various modifications of our invention, it should be understood that numerous additional modifications, changes, substitutions and alterations may be made without departing from the invention's fundamental theme. For example, we have only indicated the power means generally, and it should be understood that it can be any suitable drive, such as, an electric motor, a gasoline engine, a diesel or otherwise, or possibly steam. The means of transmission of the power to the various power shafts may be chains, gears, or what have you. The unit could be loaded with scrap metal by an electromagnet crane and the entire assembly could be put on treads or wheels so that it can be rolled from place to place. The kingpin **284** will serve as the hitch or draw. Additionally, while we have shown the unit as constructed to produce an approximately constant size bale, it could be supplied with a suitable adjusting mechanism so that the size of the bale could be varied. The operator's platform for controlling the motor and carrying out the other operations could be located next to the main post or pillar **26** on the right side of the machine, and we find this convenient. Also, we have shown the main plunger as acting in only one direction, and it should be understood that a double acting plunger may be used. In this case, the unit would have two compression chambers, or one large one, two side or small plungers, one in front and one in back, and two lids, possibly pivoted on the same pivots and rigidly connected at an angle so that while one is down the other is raised, and vice versa. The unit might also be used as a metal extrusion press. With these and other modifications in mind, we wish that the invention be unrestricted, except as by the appended claims.

We claim:

1. In a machine for pressing scrap metal or the like into bales of a predetermined size, a base, an elongated generally rectangular box closed on three sides and generally open on the fourth side and also on the top, and including a floor and upstanding front and side walls, a lid pivoted to the side walls by a lid pivot at the generally open fourth side, a main plunger movable horizontally under the lid pivot into the box and constructed to close the fourth side of the box when the main plunger is fully withdrawn and to be in a predetermined spaced relation to the front wall when the main plunger is fully extended, an auxiliary plunger movable laterally through an opening in one side wall of the box adjacent the front wall and constructed to close the opening in the said one side wall of the box when the auxiliary plunger is fully withdrawn and to be in predetermined spaced relation to the other side wall when the auxiliary plunger is fully extended, and power means for actuating the main plunger, including a pair of stationary take-up blocks with sheaves on the sides of the base, one on each side, a pair of movable take-up blocks with sheaves attached to the main plunger, one on each side, opposite the stationary blocks to provide two pair of paired take-up blocks, one such pair on each side of the base, a take-up cable passing around the sheaves of the take-up blocks, a stationary return block of sheaves attached to the base, a movable return block of sheaves attached to the main plunger, a return cable passing around the sheaves of the return blocks, a power shaft on the base, and power means for rotating it, the take-up and return cables being connected to the power shaft such that one cable will be reeled in while the other is played out, and vice versa.

2. In a machine for pressing scrap metal or the like into bales of a predetermined size, a base, an elongated generally rectangular box closed on three sides and generally open on the fourth side and also on the top, and including a floor and upstanding front and side walls, a lid pivoted to the side walls by a lid pivot at the generally open fourth side, a main plunger movable horizontally under the lid pivot into the box and constructed to close the fourth side of the box when the main plunger is fully withdrawn and to be in a predetermined spaced relation to the front wall when the main plunger is fully extended, an auxiliary plunger movable laterally through an opening in one side wall of the box adjacent the front wall and constructed to close the opening in the said one side wall of the box when the auxiliary plunger is fully withdrawn and to be in predetermined spaced relation to the other side wall when the auxiliary plunger is fully extended, and power means for actuating the main plunger, including a pair of stationary take-up blocks with sheaves on the sides of the base, one on each side, a pair of movable take-up blocks with sheaves attached to the main plunger, one on each side, opposite the stationary blocks to provide two pair of paired take-up blocks, one such pair on each side of the base, a take-up cable passing around the sheaves of the take-up blocks, a stationary return block of sheaves attached to the base by an attachment, a movable return block of sheaves attached to the main plunger by an attachment, a resilient connection between at least one of the return blocks and its attachment, a return cable passing around the sheaves of the return

blocks, and power means for the take-up and return cables constructed so that one cable will be reeled in while the other is played out, and vice versa.

3. In a machine for pressing scrap metal or the like into bales of a predetermined size, a base, a frame mounted on the base and rising above it, the frame including an elongated generally rectangular box closed on three sides and generally open on the fourth side and also on the top, and including a floor and upstanding front and side walls, a lid pivoted to the side walls by a lid pivot at the generally open fourth side and constructed to be actuated between a lower generally horizontal position closing the open top of the box and a raised position opening the box so that the box may be charged with scrap metal, a main plunger movable horizontally under the lid pivot into the box from a fully withdrawn position to a fully extended position and constructed to close the fourth side of the box when the main plunger is in its fully withdrawn position and to be in a predetermined spaced relation to the front wall when the main plunger is in its fully extended position, an auxiliary plunger movable laterally through an opening in one side wall of the box adjacent the front wall from a fully withdrawn position to a fully extended position and constructed to close the opening in the said one side wall of the box when the auxiliary plunger is in its fully withdrawn position and to be in predetermined spaced relation to the other side wall when the auxiliary plunger is in its fully extended position, and power means for actuating the main plunger, including a pair of stationary take-up blocks with sheaves on the sides of the frame, one on each side, a pair of movable take-up blocks with sheaves attached to the main plunger, one on each side, opposite the stationary blocks to provide two pair of paired take-up blocks, one such pair on each side of the frame, a take-up cable passing around the sheaves of the take-up blocks, a stationary return block of sheaves attached to the frame by an attachment, a movable return block of sheaves attached to the main plunger by an attachment, a resilient connection between at least one of the return blocks and its attachment, a return cable passing around the sheaves of the return blocks, and power means for the take-up and return cables constructed so that one cable will be reeled in while the other is played out, and vice versa.

4. In a machine for pressing scrap metal or the like into bales of a predetermined size, a base, a frame mounted on the base and rising above it, an elongated generally rectangular box closed on three sides and generally open on the fourth side and also on the top, and including a floor and upstanding front and side walls, a lid pivoted to the side walls by a lid pivot at the generally open fourth side and constructed to be actuated between a lower generally horizontal position closing the open top of the box and a raised position opening the box so that the box may be charged with scrap metal, a main plunger movable horizontally under the lid pivot into the box from a fully withdrawn position to a fully extended position and constructed to close the fourth side of the box when the main plunger is in its fully withdrawn position and to be in a predetermined spaced relation to the front wall when the main plunger is in its fully extended position, an auxiliary plunger movable laterally through an opening in one side wall of the box adjacent the front wall from a fully withdrawn position to a fully extended position and constructed to close the opening in the said one side wall of the box when the auxiliary plunger is in its fully withdrawn position and to be in predetermined spaced relation to the other side wall when the auxiliary plunger is in its fully extended position, and power means for actuating the main plunger, including a pair of stationary take-up blocks with sheaves on the sides of the frame, one on each side, a pair of movable take-up blocks with sheaves attached to the main plunger, one on each side, opposite the stationary blocks to provide two pair of paired take-up blocks, one such pair on each side of the frame, a take-up cable passing around the sheaves of the take-up blocks, a stationary return block of sheaves attached to the frame, a movable return block of sheaves attached to the main plunger, a return cable passing around the sheaves of the return blocks, a power shaft on the base, and power means for rotating it, the take-up and return cables being connected to the power shaft such that one cable will be reeled in while the other is played out, and vice versa.

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