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SCRAP BALING PRESS

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The present invention relates in general to improvements in the art of baling diverse materials, and it relates more specifically to an improved method of and apparatus for baling bulky scrap metal or the like, such as discarded sheet-metal vehicle bodies and refrigerator casings.

The primary object of this invention is to provide a simple but effective method of converting relatively bulky materials such as discarded sheet-metal automobile bodies and other bulky scrap into compact bales, and to also provide powerful and relatively inexpensive equipment for carrying on commercial exploitation of the improved method.

Various types of mechanisms for baling diverse materials have heretofore been proposed and utilized in different industries, and no unusual problems were involved in such procedure when the materials to be baled were relatively easy to handle and adapted to be easily compacted and compressed into bale formation. However, when this material was bulky and more rigid, as in the case of spent sheet-metal auto-bodies, it required very complicated and costly baling presses which were difficult to install and to manipulate, in order to produce satisfactory final bales in rapid succession; and unless an operator had unlimited quantities of such materials readily available these prior presses could not be economically installed and operated.

It is therefore an important object of the present invention to provide a new method of baling such rather unwieldy materials in a more efficient and rapid manner, with the aid of simpler and more conveniently operable mechanism.

Another important object of this invention is to provide an improved method of baling bulky sheet-metal bodies by initially applying direct pressure so as to condense and confine each body within a chamber and by thereafter subjecting the confined body to a succession of intense hammer blows in order to reduce it to more compact bale formation.

A further important object of the invention is to provide an efficient and economical system for rapidly baling discarded sheet-metal automobile bodies by introducing them into a baling chamber and by thereafter subjecting the same to intense heat and pounding action as to compact the sheet-metal into relatively solid and small bales.

Still another object of our invention is to provide improved instrumentalities for effectively baling scrap sheet-metal and for facilitating the handling of such material while introducing the same to the baling chamber and after the baling operations have been effected.

An additional object of the present invention is to provide a durable bailing press for bulky scrap sheet-metal or the like, which can be fabricated at low cost from readily available sheet-metal and structural beam or bar stock, and installed at remote and relatively inaccessible sites.

Another object of this invention is to provide powerful mechanism adapted to initially crush spent automobile bodies and to thereafter heat and hammer them into compact bale formation in rapid succession at low cost and with minimum attention, and which has enormous loading capacity.

A further object of the invention is to provide a baling press which is operable in a more effective manner and at lower cost than prior presses heretofore utilized to bale bulky sheet-metal articles.

These and other more specific objects of the invention will be apparent from the following detailed description.

A clear conception of the several steps involved in the improved baling method, and of the construction and operation of a typical mechanism for commercially exploiting the method, may be had by referring to the drawings accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the various views.

FIG. 1 is a relatively diagrammatic central transverse vertical section through a typical installation especially adapted to bale bulky sheet-metal materials such as discarded automobile bodies, showing one such body being initially introduced, and another finally baled body being delivered from the unit;

FIG. 2 is a similar sectional view of the same installation, but showing the various parts in position during normal baling operation;

FIG. 3 is a transverse horizontal section through the baling chamber alone of the press shown in FIGS. 1 and 2, the section being taken along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged central vertical section through the impact hammer of the baling press, taken along the line 4—4 of FIG. 1;

FIG. 5 is a similarly enlarged partial section through the hammer, taken along the line 5—5 of FIG. 4;

FIG. 6 is an enlarged fragmentary section through the lower portion of the baling chamber wall, taken along the line 6—6 of FIG. 1;

FIG. 7 is an enlarged transverse horizontal section through the hammer heat dissipator, taken along the line 7—7 of FIG. 4;

FIG. 8 is an enlarged fragmentary section through one of the electric circuit contacts adapted to be bridged by the hammer in order to be lifted after each impact stroke, the section being taken the same as in FIG. 1;

FIG. 9 is a fragmentary view showing the mechanism for locking the pivoted side wall of the baling chamber into and out of locking position; and

FIG. 10 is an enlarged fragmentary view showing a modified bale gripping jaw for the impact hammer.

Generally defined, the invention comprises an improved method of effectively gripping bulky sheet-metal bodies or casings by initially reducing the bulk with the aid of direct pressure so as to confine the same within an upright baling chamber, by thereafter heating and subjecting the initially compressed and confined body to repeated impacts so as to compact it into a solid bale, and by finally lifting the completed bale out of the chamber; and while the invention has been described herein as having special utility for use in baling discarded sheet-metal automobile bodies it is not intended to confine its use to such purposes. It is also contemplated that specific descriptive terms employed herein will be given the broadest possible interpretation consistent with the actual disclosure.

Referring to the drawings which rather diagrammatically illustrate a baling press for carrying on the present improved method, this press comprises in general, a series of four walls 14, 15, 16, 17 mounted upon a massive foundation 18 to form an upwardly open upright baling chamber 19; a charging and initial compression member 20 pivotally mounted at its lower end within a socket 21 embedded in the foundation 18 and being swingable into opening 22 in the chamber side wall 14; a bottom bale compressing plunger 23 movable through an opening 24 in the chamber side wall 15 into the lowermost end of the chamber 19; a number of torches 25 mounted in
a lower cooled portion 26 of the chamber side wall 16 for intensely heating the material within the chamber 19; a heavy gravity actuated drop hammer 27 operable by an electric motor 28 or a winch mechanism 29 to subject the material confined within the chamber 19 to repeated impacts; and lifting jaws 30 carried by the hammer 27 for elevating the final bales 31 out of the lower portion of the chamber 19 and for depositing the same upon a discharge gate or shelf 32 directly suspended from an upper portion of the wall 16 adjacent to a bale delivery opening 33 formed in this wall.

The chamber walls 14, 15, 16, 17 and the laterally swingable compression member 20 may be formed of heavy standard I-beams and box beams welded or otherwise firmly united and the internal spaces of these structures may be filled with concrete while the faces of these beams nearest to the chamber 19 are preferably covered with replaceable sheet-metal liner plates 34 so as to provide smooth internal surfaces throughout the interior of the baling chamber, see FIGS. 1, 2 and 3. The foundation 18 may also be amply reinforced along its top by other I-beams 35 held in place by U-bars 36 and should be of sufficient height to absorb the vibration resulting from the baling operations, and the chamber walls should also be stabilized by suitable braces 37 formed of I-beams or the like and of which the braces 37 coacting with the wall 16 may be cooperatively driven into the incline bale delivery slot cooperating with the discharge shelf 31, as depicted in FIG. 1. The bottom of the chamber 19 may also be provided with a replaceable liner 38 extending in close proximity to the socket 21.

The charging and initial bulk reducing member 20 which is pivotally mounted to swing about the socket 21 may also be provided with a cooled lower portion 39, and water or other cooling medium may be circulated through the jacket portions 26, 39 in any suitable manner while the press is operating. The formation of the pivot socket 21 is very important, and this socket has a quadrant recess 40 therein with which the lower similarly curved end 41 is cooperable to constantly cause the member liner 34 to snugly engage the adjacent end of the chamber liner 38, as illustrated in FIGS. 1 and 2. This engagement extends throughout the entire width of the compression member 20 and serves to positively prevent vertical movement of which the bale is baled, from entering the pivot socket 21, and the upper extremity of the member 20 is cooperable with a heavy sheet-metal hopper 42 supported from the foundation 18 upon I-beams 43 and sheet-metal side plates 44 to provide a loading platform 45 near the top of the unit.

The initial loading and initial compression member 20 is swingable from inclined position in alinement with the inclined surface of the hopper 42 as in FIG. 1, to upright position within the chamber side opening 22 as in FIG. 2, by means of a toggle mechanism consisting of a sturdy plate element 46 pivotally connected to ears 47 attached to the rear of the member 20 and having its opposite end pivotally attached by a pin 48 to the adjacent end of another sturdy plate element 49 the opposite end of which is pivotally connected to ears 50 carried by the fixed beams 43. The pin 48 is carried by the piston 51 of a double acting hydraulic ram the cylinder 52 of which is swingably supported upon a pin or pilot 53 mounted upon a bracket 54 secured to the foundation 18, and this ram may be supplied with actuating liquid from any suitable source. When the ram piston 51 is retracted to flex the toggle as in FIG. 1, the member 20 is inclined so as to direct the material such as a discarded automobile body 55 and to direct the same into the laterally open baling chamber 19, and as the ram piston 51 is forced outwardly and the member 20 swings upwardly, the body 55 slides by gravity into the chamber 19 and has its bulk quickly compacted and reduced by direct pressure imparted thereagainst by the jaw member 20.

After this initial compacting of the body 55 has been

 effected, it is necessary to positively lock the loading member 20 within the opening 22 of the chamber wall 14, so as to prevent subsequent internal baling forces from displacing the member and subjecting the toggle to excess pressure. Such locking is effected by a bar 56 swingably suspended upon a pin 57 carried by a bracket 58 secured to one side wall of the hopper 45, and which bar is adapted to swing into the upper end of the member 20 when in upright position and to rest on side walls 49 in the opposite side walls of the hopper 45, see FIGS. 1, 2 and 9. The bar 56 is swingable about the pivot pin 57 by means of a hydraulic ram having its plunger 60 attached to the outer bar end, while its cylinder 61 is pivotally mounted upon another bracket 62 carried by the same hopper side wall which carries the bracket 58, as shown in FIG. 2.

The lower bale compressing plunger 23 which is movable into the bottom of the chamber 19 through the opening 24 in the side wall 15, after each bale 31 has been finally formed but before it is withdrawn from the baling chamber, is also operable by a hydraulic ram as shown in FIGS. 2 and 6. This plunger 23 is slidable along the bottom liner plate 38 and is pivotally connected by a central link 62 with one end of a lever 63 an intermediate portion of which is mounted to swing about a pivot pin 64 journelled in a bracket portion 65 while the opposite end of the lever 63 is pivotally attached to the plunger 23 of a hydraulic ram the cylinder 67 of which is swingably suspended from a pin 68 mounted in another bracket 69 also secured to the wall 15. When the ram plunger 66 is moved outwardly it forces the plunger 23 into the bottom of the chamber 19 so as to finally compress the bale resting upon the bottom plate 38, and all of the hydraulic rams are operable with fluid under pressure derived from a suitable source and are independently controllable by an attendant platform 45.

The torches 25 for intensely heating the material confined within the chamber 19 while it is being finally baled, may be of any suitable type, but are preferably mounted for movement so that the flames can be directed at various angles relative to the confined charges of scrap metal. They may also be ignited by desired means to the operator on the platform 45 and serve to soften the sheet-metal while it is being finally compacted into bale formation. Such torches 25 may be provided in any of the lower water cooled portions of the chamber walls 14, 15, 16, 17 through which cooling liquid is constantly charged while the unit is in operation and function to greatly augment the effectiveness of the impact hammer 29.

The impact hammer 27 is an important feature of the present improvement, and is adapted to be suspense from a cable 70 and repeatedly elevated by the winch 29 and dropped by gravity so as to impart successive severe blows to the scrap confined within the chamber 19. As shown in FIGS. 4 and 5, the hammer 27 consists of a box-like sheet-metal outer casing 71 the exterior of which is slightly tapered so that its lower end will rather snugly but slidably coact with the linear portion of the chamber 19 while its upper portions have greater clearance. The interior of the casing 71 is spanned by three horizontal superimposed durable sheet-metal partitions 72, 73, 74, and a central tube 75 extends from the top of the hammer through the upper partition 72 and is open communication with a chamber 76 formed by spaced upright sheet-metal walls 77, connecting the partition 73 with the lower partition 74. These walls 77 and several other upright walls 78 provide a strong impact structure at the lower end of the hammer and also form segregated chambers 79 connected to a larger chamber 80 above the medial partition 73 by openings 81. The lower partition 74 also has a central opening therein normally sealed by a heavy cap 82, and the upper partition 72 is spanned by a pair of channel beams 83 secured
to the tube 75 and to which heavy upright plates 84 spanning the casing chamber 80 are secured. The lower extremity of the side walls of the hammer casing 71 are wedge shaped and reinforced by wedges 85 made of wear resisting metal, and upper portion 72 may be provided with a removable pressure relief valve 86 and with one or more cup-shaped radiator tubes 87 depending within the chamber 80 and each having a series of radial cooling fins 88 therein, as shown in FIGS. 4 and 7. In order to provide the hammer with sufficient hefty impact powerful impacts or blows, the valve 86 may be removed and then the lower chamber 79 may be filled more or less with metal balls 89 while all of the chambers 79, 80 may also be supplied with liquid as illustrated in FIGS. 4 and 5. The upper extremity of the hammer casing 71 is also preferably provided with a removable closure as shown in FIG. 4, resting on the beams 83 and provided for vapor vents. A durable and heavy impact hammer assembly in which the liquid is cooled by the radiators while excess pressure may be relieved through the safety valve 86, is thus provided.

In order to effect successive lifting of the hammer and to permit actuation of the bale elevating jacks 30, a stem 91 is mounted centrally within the tube 75 and has its lower end pivotally connected to the inwardly projecting arms 92 of the angular jacks 30, while its upper end is permanently attached to the end of the cable 70 by a ring 93 or the like. Below the ring 93, the stem 91 is provided with an opening which is normally engaged by a hook 94 having pivot pins 95 projecting from its opposite sides and which are journaled in the plates 84, and the hook 94 is also provided with an integral actuating arm 96 for releasing it from the stem 91 when so desired. When the hook 94 is disposed as shown in FIGS. 4, 5 and 6, the hammer is firmly connected to and suspended from the cable 76 and the stem 91 is not movable relative to the hammer casing 71. The angular bale lifting jacks 30 which have their arms 92 pivotally cooperable with the lower end of the stem 91, have depending gripping arms 97 provided with formations for effectually grabbing the completed bales 31, while the bends connecting the arms 92, 97 are pivotally confined within the hammer casing 71 by lugs 98. The arms 97 normally lie in contact with the adjacent casing walls within the wedges 85 as in FIG. 5, and a heavy coil spring 99 confined within the cap 82 coacts with the stem 91 while a lighter coil spring 100 coacts with the inner ends of the arms 92 and with the partition 73, so that whenever the hook 94 is released from the stem 91, the heavy spring 99 will swing the jaw arms 97 inwardly into gripping position and when the hook is re-applied to the stem the lighter spring 100 will hold the jaw arms 97 confined within the wedges 85. In FIG. 5, the gripping formations on the jaw arms 97 are merely a plurality of fixed teeth 101; but in the modified jaw 30' of FIG. 10, the lower extremity of each jaw arm 97' is provided with a pivoted gripping block 102 adapted to be swung into active position by a lever spring 103 when the jaw arm 97' is swung inwardly and to be retracted into inactive position by the adjacent casing wall when the gripping jaw is returned to normal position.

Whenever a bale 31 has been properly formed the operator should be notified, and this is accomplished by a suitable signal such as a light or a siren when the hammer 27 has completed its function. The lower portion of a wall 16 of the chamber 19 is provided with several spaced contacts 104 embedded in the liner 34, as shown in FIGS. 1, 2 and 8, and which are adapted to be bridged by the metal hammer casing 71 so as to complete the circuit, and when this occurs, the final compression plunger 23 should be actuated to fully compress the bale by dropping the gripping jacks 30 should be released by withdrawing the hook 94 whereupon the hammer may be dropped to grip the completed bale 31. The hammer 27 with the bale 31 attached should then be elevated to the height indicated in FIG. 1, so that the bottom of the suspended bale 31 will be above the discharge opening 33 in the wall 16, and in order to positively hold the hammer 27 in such elevated position a holding latch 105 which is slidable inwardly through a hole in the wall 16 and is engageable in a notch 106 in the side of the hammer casing 71 is provided. This latch 105 is adapted to be reciprocated manually by means of a hand lever 107 located in a convenient right of way on the platform 45. After the hammer 27 with the finished bale 31 attached, has been thus elevated and latched, the discharge shelf or gate 32 which is normally confined within the opening 33 as in FIG. 2, must be swung into active position spanning the chamber 19 as in FIG. 1. This is accomplished by means of a hydraulic ram as shown in FIG. 2, the cylinder 108 of which is pivotally attached to the chamber wall 15 and which has a plunger 109 pivotally attached to the swinging end of a lever arm 110 which is firmly secured to the supporting pivot 111 of the gate 32. The gate 32 is also provided with a buffer spring 112 for cushioning the fall of the bale 31 when they are released from the elevated hammer 27 by retraction of the gripping jaws 30, and after a bale 31 has been deposited upon the inclined shelf 32 the hydraulic ram may be actuated to swing the same into upright position as in FIG. 2 and to thereby deposit the final bale onto the inclined beams 37 as depicted in FIG. 2.

When the improved baling unit has been properly constructed and installed as above described, and the various hydraulic rams have been connected to a suitable source of liquid supply and provided with controls of well known construction, while the heating torches 25 have also been connected to a fuel supply source in a well known manner and the necessary electric circuits have also been provided, the unit may be actuated to effectually bale diverse scrap materials and especially bulky material such as sheet-metal bodies 55 in rapid succession. While the normal functioning of the equipment should be quite apparent from the foregoing detailed description of the various parts, a short résumé of one cycle of operations when carrying on the improved baling method, will be given.

A single operator stationed upon the platform 45 can operate the control mechanism to initially dispose the member 20 in loading position as in FIG. 1A, and then position the heater member 20 on the heating torches 25 while the hammer 27 is being held in elevated position by the latch 105 and the gate 32 is in inactive position within the opening 33. A scrap-metal body 55 may then be deposited within the hopper 42 as in FIG. 1, and when it has slid by gravity toward the lower end of the member 31, the member should be promptly swung about its pivot 41 toward the chamber 19 and into the opening 22 to initially compact and inject the body 55 by direct pressure into the chamber 19 as in FIG. 2, and to subject the same to the heating flames delivered from the torches 25. The locking bar 56 should then be tripped by the fall of the bale 31 when the member 20 in upright position, and the hook 94 of the elevated and latched hammer 27 should be applied to the stem 91 to hold the jaws 30 retracted, whereupon the latch 105 should be released and motor 28 and the winch 29 may be actuated to cause the hammer to be repeatedly dropped by gravity and elevated by the winch so as to subject the heated scrap metal confined within the chamber 19 to successive impacts.

After the final compression of the sheet-metal as indicated to the operator by the signal actuated by the contacts 104, and while the hammer is elevated, the plunger 23 should be actuated to finally compress the bale laterally by direct pressure preparatory to the lifting of the bale 31 out of the chamber 19. The operator should then release the hook 94 of the hammer 27 so as to release the gripping jacks 30 whereupon the hammer can be lowered to cause the jaws 30 to firmly grip the finished
bale 31, and the hammer with the bale suspended therefrom may then be elevated as in FIG. 1 to raise the bale above the top of the opening 33. The elevated hammer 27 should be locked by manipulation of the latch 105 whereupon the bale delivery gate 32 may be positioned across the chamber 19, and the completed bale may be released by re-insertion of the hook 94 in the stem 91 to permit the bale 31 to drop by gravity upon the gate 32. This gate may thereafter be restored to upright position thus causing the finished bale to drop onto the beams 37 and to be delivered from the unit.

This cycle of events may be rapidly repeated by an experienced operator to cause the machine to quickly produce well formed finished bales 31 in succession, and the intense heating of the confined scrap materially aids the impact hammer in producing compact solid final bales. The improved method of forming the bales is simple and can be commercially exploited with relatively simple equipment the cost of construction and installation of which is very moderate as compared to that of prior presses for similar usage. The enormous loading capacity of the improved unit and the initial compression of the bulky material by direct pressure, enhances the speed of production of the bales, and this speed is also enhanced by the semi-automatic functioning of the unit. The maintenance cost of the equipment is also very low to the fact that parts which are normally subject to greatest wear are readily replaceable, and the mechanism is also operable with utmost ease and safety.

The improved method has proven highly satisfactory and successful and can be effectively employed in dealing with bulky and tenacious scrap of various kinds. It should be understood that it is not desired to limit this invention to the exact steps of the method and to the precise details of construction of the apparatus described and shown, for various modifications within the scope of the appended claims may occur to persons skilled in the art.

We claim:

1. A bale for bulky bodies of sheet-metal or the like, comprising, means forming an elongated upright baling chamber having an open side and a lateral lower opening and an upper end opening, a side wall swingable toward said chamber to introduce and initially reduce the bulk of a body to be baled by applying direct pressure to force the body into said chamber through said open side, a gravity-actuated hammer movable along the chamber and being operable to subject the confined body to repeated impacts to compact the same into bale formation, a plunger movable to subject the confined body to direct pressure in a direction transversely of said initial introduction to further compact the bale, and a pair of jaws normally concealed within but being movable out of said impacting hammer to positively grip and withdraw the finished bale from within said chamber through said upper end opening.

2. A bale for bulky bodies of sheet-metal or the like, comprising, means forming an elongated upright baling chamber having an open side and an upper end opening, a side wall swingable toward said chamber to introduce and initially reduce the bulk of a body to be baled by applying direct pressure to force the body into said chamber through said open side, a gravity-actuated hammer movable along the chamber and being operable to subject the confined body to repeated impacts to compact the same into bale formation, and a pair of jaws normally concealed within but being movable out of said impacting hammer to positively grip and withdraw the final bale from within said chamber through said upper end opening.

3. A bale for bulky bodies of sheet-metal or the like, comprising, means forming an elongated upright baling chamber having an open side and an upper end opening, a side wall swingable toward said chamber to intro-
chamber side, a pivot socket located adjacent to said plate edge and having a concave arcuate surface facing but spaced from said edge, a side wall having its lower end arcuately curved to pivotally and engage said socket surface and being swingable toward said open chamber side to close the same and against said bottom plate edge to produce a positive seal between the swinging side wall and said plate edge, a gravity actuated hammer reciprocable within said chamber through said open top in close proximity to said walls and toward said bottom plate to compact a body initially confined within the chamber by said swingable wall into bale formation, and a pair of jaws normally confined within said hammer and being operable to positively grip and lift the finished bale out of said chamber through said open top.

8. A baler for automobile bodies or the like, comprising, several fixed walls defining an elongated upright chamber having one open side and an upper bale delivery aperture in a fixed side wall thereof, a wall movable toward said open side to confine and to initially reduce the bulk of a body to be baled by pressing the body into said chamber against said fixed walls, a hammer reciprocable within the chamber and being operable by gravity to compact the confined body into bale formation within the bottom of the chamber, gripping means carried by said hammer and being operable to positively grip and to lift the final bale from within said chamber when the hammer and the suspended bale are elevated beyond said delivery opening, a bale delivery gate normally closing said upper opening and being movable inwardly across the top of said chamber when the hammer and a suspended bale have been elevated beyond the delivery opening, and means for releasing said gripping means to drop the finished bale onto said gate for delivery through said opening.

9. A baler for automobile bodies or the like, comprising, several fixed walls defining an elongated upright chamber having one upon side and an upper bale delivery aperture in a fixed side wall thereof, a pivoted wall swingable toward said open side to confine and to initially reduce the bulk of a body to be baled by pressing the body into said chamber against said fixed walls, a hammer reciprocable within the chamber and being operable by gravity to compact the confined body into bale formation within the bottom of the chamber, gripping means suspended from said hammer and being operable to positively grip and to lift the final bale from within said chamber when the hammer and the suspended bale are elevated beyond said delivery opening, a pivotedly mounted bale delivery gate normally closing said upper opening and being swingable inwardly across the top of said chamber when the hammer and a suspended bale have been elevated beyond the delivery opening, and means for releasing said gripping means to drop the finished bale onto said gate for delivery through said opening when the gate is returned to normal position.

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