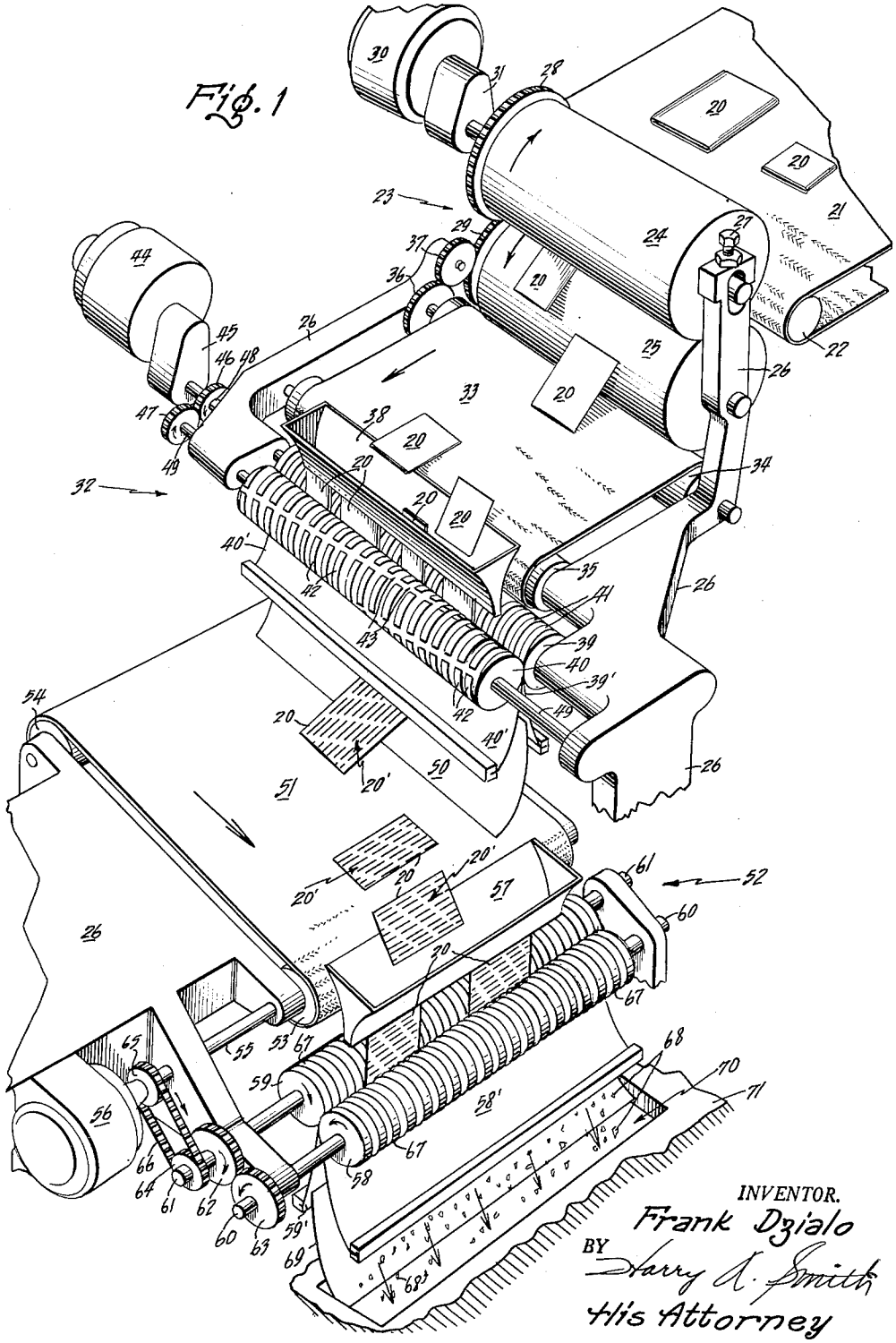
May 1, 1962 F. DZIALO 3,031,745

MACHINE AND METHOD FOR RECLAIMING TIN CANS AND THE LIKE TO BE MADE INTO ALLOYED BILLETS OF TIN AND METAL

Filed June 1, 1959 3 Sheets-Sheet 1

Fig. 1



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Filed June 1, 1959 3 Sheets-Sheet 2

Fig. 2

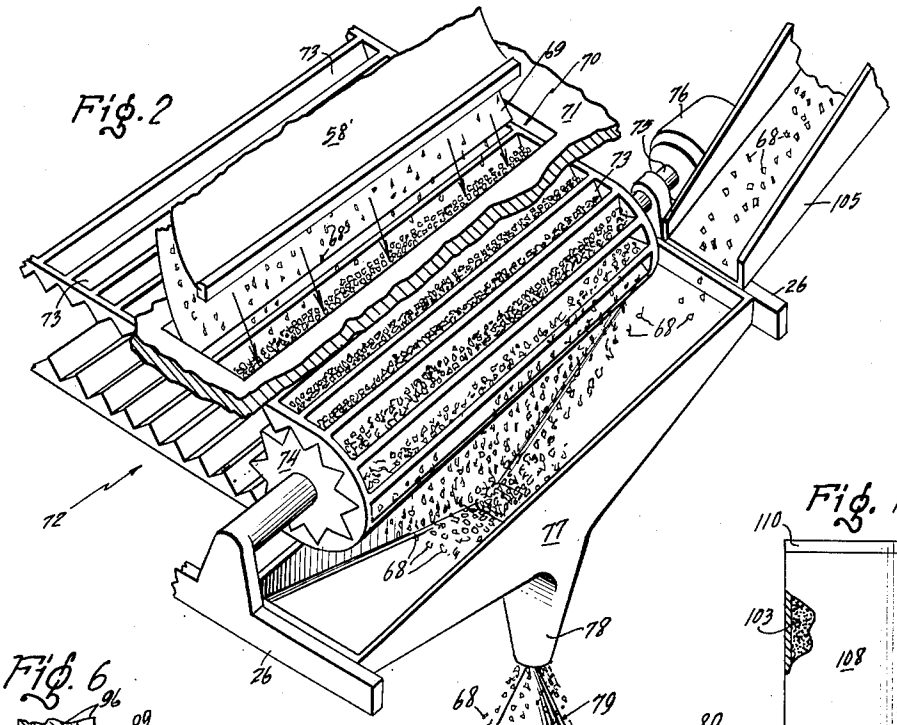


Fig. 13

Fig. 6

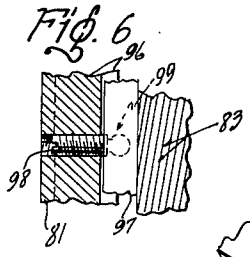


Fig. 3

Fig. 4

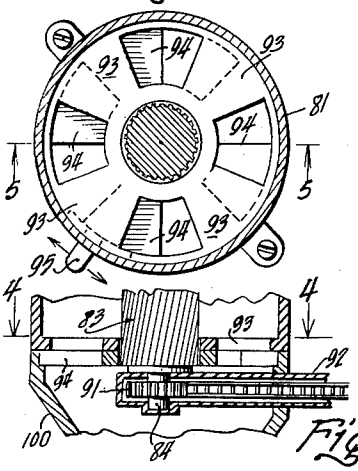


Fig. 5

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MACHINE AND METHOD FOR RECLAIMING TIN CANS AND THE LIKE TO BE MADE INTO ALLOYED BILLETS OF TIN AND METAL

Filed June 1, 1959 3 Sheets-Sheet 3

Fig. 7

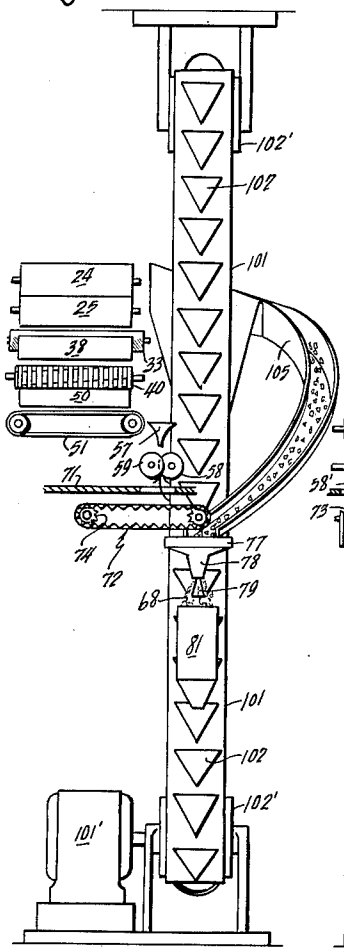


Fig. 8

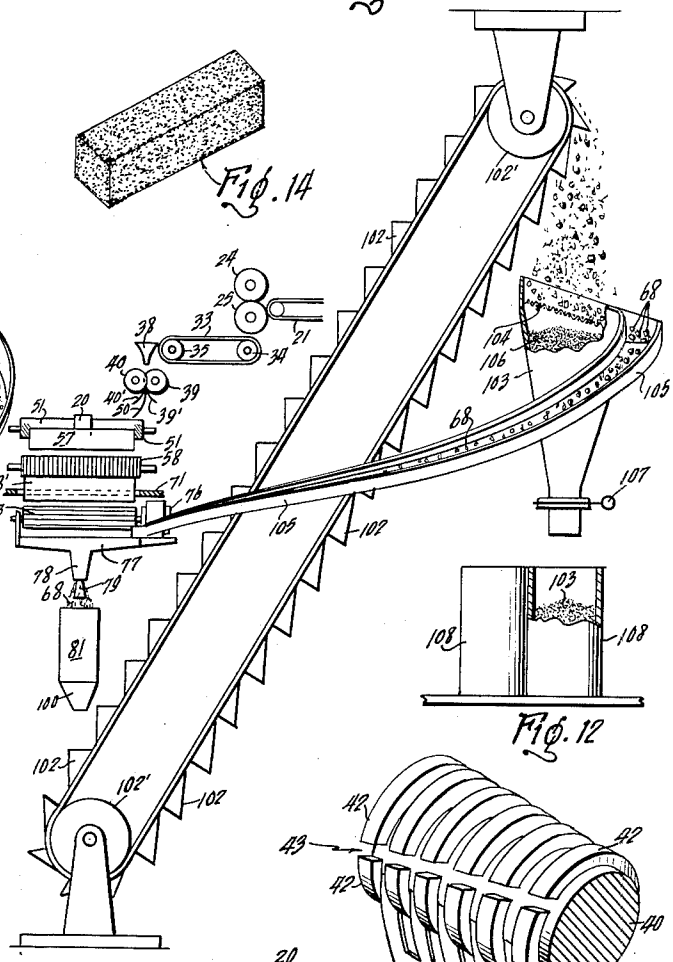


Fig. 14

Fig. 12

Fig. 9

Fig. 11

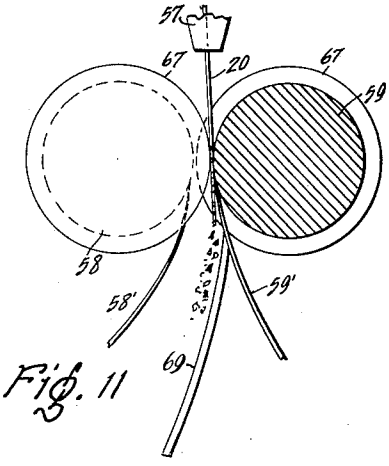
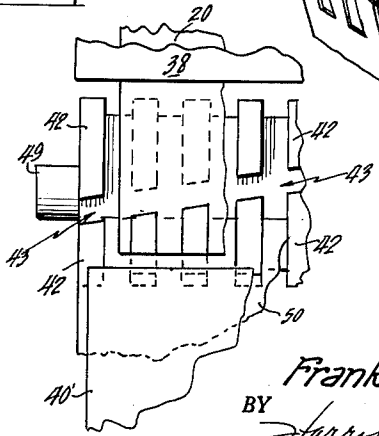


Fig. 10



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3,031,745

MACHINE AND METHOD FOR RECLAIMING TIN CANS AND THE LIKE TO BE MADE INTO ALLOYED BILLETS OF TIN AND METAL

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Filed June 1, 1959, Ser. No. 817,244
23 Claims. (Cl. 29—403)

This invention has to do with the reclaiming of tinned metal waste pieces, such as discarded tin cans, tin plate scrap, and the like, and to the transforming of such pieces into a condition whereby both the tin and metal are recovered as an article in the form of a billet that is an alloy of the tin and metal constituting the same, and the provision of a machine, or apparatus, and a method for making and obtaining such an article is the principal object of the invention.

I am well aware of the fact that various methods and means have been employed for treating such waste materials, especially discarded tin cans, but, insofar as I am aware, these differ from what is herein disclosed and claimed. For example, tin cans have been crushed and flattened, or otherwise treated, by various means, whereby they could be subjected to a melting process in furnaces, but primarily to recover the more valuable tin which comprises a small part of the whole. In recovering the tin, the thin sheet metal or steel of tin cans is burned up because of the intense heat required and is otherwise lost in the form of slag, and too often such means and methods heretofore employed have proven to be uneconomical. It has long been felt that it would be a distinct improvement if such waste products could be substantially recovered in their entirety in the form of an alloy of tin and steel, or otherwise, such as in articles in the form of billets for the many uses to which the same could be adapted, and this can now be accomplished by means of the present invention.

Generally, therefore, it is an object of the present invention to provide such a method for obtaining such articles in an economical manner, and a machine for practicing the same that is relatively economical of manufacture, simple, yet sturdy and durable of construction, that will operate with relative freedom from wear and tear or other mechanical difficulties, and is otherwise well suited to the purposes for which it is intended.

More specifically, it is an object of the invention to provide a means for slitting such tin cans or the like transversely thereof in one direction at interrupted intervals to hold them intact after the same have been compressed and reduced to relatively flat pieces, with means for severing the pieces transversely of the slits to separate them into a plurality of substantially coarse particles, and means for substantially pulverizing the particles so that selected quantities thereof can be placed in containers and heated to the approximate fusion temperature of the tin and included metal to alloy the same and provide billets thereof.

It is also a specific object to provide a novel type of slitting mechanism for such pieces comprising two cylindrical rollers, each of which is provided with circularly arranged, spaced-apart slitting elements adapted to be interleaved with each other, each of the elements on one of said rollers forming a complete circle, and each of the elements on the other roller forming segments of a circle, the latter elements being spaced at intervals to form grooves along helical lines around such roller, in order that the pieces will be slitted transversely along spaced parallel lines at diagonally interrupted intervals to hold the pieces intact.

Another specific object of the invention is to provide a novel type of pulverizing mechanism comprising a vertically disposed cylindrical housing, with an elongated cylindrical roller having a plurality of closely spaced, parallel, helically arranged cutting elements around its periphery, and mounted to rotate coaxially of the housing, and a plurality of elongated, radially disposed, counter-cutting elements vertically mounted in the housing with their cutting edges adjusted closely adjacent the helical blades substantially thoughout their lengths.

A further specific object of the invention is the provision of means for separating coarse particles from the "fines" coming from the pulverizer and returning the same thereto likewise to be reduced to fines in order that only fines can be collected for alloying the same into billets as well as to keep the pulverizer in production during any lapse in the feeding of coarse particles.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the several steps and the relation of one or more of such steps with respect to each of the others, the apparatus embodying features of construction, combinations and arrangement of parts, adapted to effect such steps, and the article which possesses the characteristics, properties and relation of elements, all as exemplified in the detailed disclosure hereinafter set forth and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of the upper portion of the machine, with parts broken away, illustrating only such essentials as the compression mechanism, the slitting mechanism, and the severing mechanisms, in stepped relation;

FIG. 2 is a perspective view of a fragmentary portion of a collecting conveyer and hopper for the coarse particles;

FIG. 3 is a perspective view, with parts broken away and partly in section, of a preferred type of pulverizing mechanism;

FIG. 4 is a sectional view, taken through the bottom of the pulverizer mechanism, as indicated along the lines 4—4 of FIG. 5;

FIG. 5 is a vertical sectional view of the bottom of the pulverizer, as indicated along the lines 5—5 of FIG. 4;

FIG. 6 is a fragmentary detail sectional view of a portion of the pulverizer, taken along the lines 6—6 of FIG. 3, illustrating the blade adjustment means;

FIG. 7 is a front elevational view of a re-routing conveyer for the coarse particles with the above described mechanisms depicted in more or less diagrammatic form in cooperative association therewith;

FIG. 8 is a side elevational view of FIG. 7;

FIG. 9 is a perspective view of one of the slitting rollers illustrating the helically arranged slitting elements with a particle removing comb associated therewith;

FIG. 10 is an elevational view of a fragmentary end portion of FIG. 9 showing a flat work piece passing across the slitting elements;

FIG. 11 is a sectional view similarly illustrating a work piece being passed between the severing rollers;

FIG. 12 is an elevational view of metal collecting containers, one of which is partly broken away and in section showing collected fines therein;

FIG. 13 is an elevational view of such a container plugged at both ends, with a fragmentary portion removed from the side wall showing the fines packed therein; and

FIG. 14 is a perspective view of a billet comprising an alloy of tin and metal formed from the container of FIG. 13.

Referring now more particularly to the drawings, the

method and machine will now be described and the operation of the machine will become obvious as the description proceeds.

The waste tinned metal pieces, whether they be in the form of tin plate scrap or discarded tin cans, are usually flatened by some means to a considerable extent before being fed into the machine. Such pieces are indicated at 20 being fed into the machine by means of a conveyer belt 21 passing around an idler roller 22 adjacent the final compression mechanism, indicated generally at 23.

The compression mechanism includes two heavy, smooth face compression cylinders 24 and 25 disposed in vertical face-to-face alignment and rotate in upper and lower bearings on the side frames 26 of the machine. The upper roller 24 preferably is spring-loaded and adjustable by setscrews 27. Each cylinder at adjacent ends is provided with ring gears 28 and 29 that are meshed together to rotate the same. These are driven by a motor 30 having a gear reduction device 31 connected to the upper ring gear 28.

The slitting mechanism is indicated generally at 32 and includes a conveyer belt 33 cooperatively associated with the compression mechanism and passes around two rollers 34 and 35, likewise mounted in the side frames 26 of the machine. One of these rollers has a gear 36 adjacent the lower ring gear 29 and is driven therefrom through an idler gear 37 connecting the same. The compressed pieces 20 are carried by the conveyer belt into a hopper 38 overlying the bight of two slitting rollers 39 and 40 so that the pieces 20 are vertically dropped therebetween. The first of these rollers has a plurality of spaced-apart, circular slitting elements or knives 41 disposed around its periphery. The other roller 40 likewise has a plurality of slitting elements or knives 42 adapted to be interleaved with the knives 41. It will be observed that the knives 41 form a complete circle around the periphery of the roller 39; but that each of the knives 42 on the roller 40 forms segments of a circle the same being spaced apart at intervals to form grooves along helical lines 43 in order that the pieces 20 may be slitted transversely along parallel spaced lines at diagonally interrupted intervals to hold such pieces intact, as indicated generally at 20' on the first piece shown coming through the slitting mechanism indicated generally at 32. Each of the rollers 39 and 40 are mounted to be rotated in the side frames 26 by a motor 44 through a gear reduction device 45, rotating intermeshed gears 46 and 47 connected to shafts 48 and 49 on the rollers 39 and 40 respectively. In order that no particles should cling between the spaced-apart knives, there are provided two combs 39' and 40' having a deflecting plate 50 therebetween to shunt the slitted pieces onto another conveyer belt 51 of a severing mechanism indicated generally at 52 and now to be described.

The severing mechanism, it will be observed, includes the conveyer belt 51 that is mounted to travel in a direction normal to the direction of travel of the conveyer belts 21 and 33. The conveyer belt 51 is likewise mounted in the frame of the machine around rollers 53 and 54, the roller 53 having a driven shaft 55 journaled in the frame of the machine and driven by a motor 56. The slitted work pieces 20 are transmitted by the conveyer belt 51 in a direction at right angles to the slits 20' and dropped vertically into a hopper 57 between the bight of two severing rollers 58 and 59. Both of these rollers are provided with spaced-apart severing elements or knives in all respects similar to the roller 39 and the knives 41 thereon which are likewise interleaved with each other and need no further description. The rollers 58 and 59 are mounted to rotate on shafts 60 and 61 journaled in the side frames of the machine to extend therethrough. On the shaft 61 is a drive gear 62 which is meshed with a driven gear 63 on the shaft 60. The shaft 61 is likewise rotated by a motor 56 through a sprocket 64 on the shaft 61 and a sprocket 65 on the shaft 55 connected by a drive chain 66 to rotate the parts described in the direction shown by the arrows, as shown in FIG. 1.

Since both the cutting rollers 58 and 59 have cutting knives or shears 67 that are circular and not interrupted by any helical grooves in either of such severing rollers, the slitted pieces 20 passing therebetween are completely severed into substantially coarse particles 68. The rollers 58 and 59 are likewise provided with combs 58' and 59' extending between the spaced-apart cutting knives 67 to dislodge any particles clinging therebetween so that all of the particles 68 are removed to be deflected by the deflecting member 69 through an opening indicated generally at 70 to a hopper plate 71 forming part of the machine.

Underlying the opening 70 is a collecting conveyer belt, indicated generally at 72 (see FIG. 2). This belt has elongated cups or recesses 73 to collect the coarse particles of metal 68 so that the same do not spill over and will not vibrate from the conveyer 72. This belt is driven by a toothed or serrated type of roller 74 that is interfitted with depressions on the inner travel of the conveyer formed by the elongated cups 73, such roller being mounted in the side frame of the machine on a shaft 75 driven by a motor 76.

Underlying the dump end of the cupped conveyor belt 72 is a pitched hopper 77 to collect the particles 68 centrally thereof by gravity and drop them through a frustoconical chute 78 against a cone deflector 79 where such particles are properly and evenly spread out into the pulverizing mechanism, indicated generally at 80.

The pulverizing mechanism comprises a vertically disposed cylindrical housing 81 and has coaxially mounted therein an elongated cylindrical roller 82 provided with a plurality of closely spaced, parallel, helically rounded cutting blades around its periphery, as indicated generally at 83.

This cutting member or roller 82 is mounted to rotate on stud shafts 84 at opposite ends thereof, journaled in a C-shaped frame 85 extending above and below within the cylinder or housing 81. This frame has outwardly extending arms 86 carrying a vertically disposed motor 87 which has a sprocket 88 on the motor drive shaft 89. Connected in driving relation with the sprocket 88 is a drive chain 90 which passes through an opening in the lower end of the housing 81 to a sprocket 91 on the lower stud shaft 84. The chain is suitably protected by a shield 92 against downwardly moving metal particles coming from the pulverizer. Overlying the chain in the bottom of the housing is a shutter having fixed arms 93 and movable arms 94 that may be rotated manually by the lever 95 to open and close the bottom of the hopper.

Within the housing 81 are a plurality of elongated sockets 96 and these are radially disposed therein to receive elongated cutting blades 97 whose cutting edges lie closely adjusted throughout the length of the helical cutting blades 83 of the cylindrical cutting roller 82. Such blades 97 are movable toward and away from the helical cutting blades 83 by any suitable adjustment means, such as upper and lower setscrews 98 terminating in a ball, and a socket in each blade 97, as indicated in dotted lines at 99 in FIG. 6.

The coarse particles 68 that are piled up in the housing 81 are finely comminuted to a substantially pulverized condition between the blades 83 and 97 and in this condition are released through the shutter in the bottom of the housing 81 by manual manipulation of the arm 95.

The finely comminuted particles in the form of fines pass through a truncated conical extension 100 functioning as a hopper connected to the bottom of the housing but intermingled therewith will be a substantial portion of the coarse particles 68. It is desirable that only the fines be utilized for alloying purposes into billets or ingots and therefore it is essential that any escaped coarse particles be captured for the purpose of converting

them likewise into such fines. To this end there is provided an inclined conveyor 101, driven by a motor 101' on shafts around rollers 102', having conveyor cups 102 into which the intermingled fines and coarse particles are deposited from the hopper 100 under the housing 81. The mixed particles are carried to an elevation substantially above the pulverizer where they are dumped into a collecting hopper 103. At the top of this hopper is an inclined screen 104 of suitable mesh through which the fines will pass to be collected as shown in FIG. 8. The screen 104 is so inclined that the coarse particles which do not penetrate the same will roll therefrom into a connecting conveyer chute 105 by gravity although it will be understood that the screen 104 or collecting hopper 105 may be slightly vibrated to bring this about. The conveyor chute is downwardly pitched at a sufficient angle so that the coarse particles 68 will be downwardly carried by gravity along this chute which is connected at its lower end with the connecting hopper 77 whereby the escaped and recaptured coarse particles are again subjected to the pulverizing mechanism 80 until they too can be collected as fines, as shown at 106 in the collecting hopper 103.

The bottom of the hopper 103 is provided with a control valve 107 to be opened or closed as desired so that the fines may be deposited into suitable containers 108 as shown in FIG. 12. These containers may take any desired form. They may be containers especially made for the purpose so that they can be closed at their tops with the fines packed therein; or, they may comprise ordinary sections of pipe having a plugged bottom 109 and a plugged top 110, as shown in FIG. 13.

Such containers are then subjected to heat treatment aproximating the fusion temperature of the tin and metal contained therein as well as the metal of the container and such temperature is in the neighborhood of 2200° F. After a suitable heating period when the containers and contents become sufficiently soft or malleable and the entire mass has been fused, the same may be worked into ingots or billets in any desirable manner, such as by rolling, hammering, or the like, to provide an article such as that shown in FIG. 14. Such an alloy of tin and metal, or steel, has numerous uses in industry and what was once a scrap pile from which at times only the tin was recovered at great expense while the steel was burned up, now has been made into a useful article of manufacture.

It will thus be seen that the objects hereinbefore set forth may readily and efficiently be obtained and since certain changes may be made in carrying out the above method and in the article, and modifications effected in the apparatus for practicing the principle thereof, without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a machine of the character described for reclaiming tin cans, comprising means for slitting said cans transversely thereof in one direction at interrupted intervals to hold them intact after the same have been compressed and reduced to relatively flat pieces; means for severing said pieces transversely of said slits to separate the same into a plurality of substantially coarse particles; and means for substantially pulverizing said particles so that selected quantities thereof can be placed in containers and heated to the approximate fusion temperature of the tin and metal contained therein to alloy the same and provide billets thereof, all of the recited means being so cooperatively and correlatively, associated, arranged and constructed such that said tin cans are siltted transversely in one direction at interrupted intervals, said tin cans are severed transversely of said slits into a plurality of substantially coarse particles and said coarse particles are pulverized.

2. In a machine as defined in claim 1, and further characterized in that said slitting means comprises two opposed cylindrical rollers, one of which is provided with a plurality of spaced apart circular slitting knives secured around its periphery; and the other of which is provided with a plurality of spaced apart curved slitting knives, as well as separated from each other around their axes of rotation, secured to its periphery, and interleaved with the knives on said first roller, whereby to slit said pieces at interrupted intervals.

3. In a machine as defined in claim 1, and further characterized in that said severing means comprises two opposed cylindrical rollers, each of which is provided with circular severing knives spaced from each other, and the knives of one roller being interleaved with the knives of the other roller, whereby to sever said slit pieces into coarse particles.

4. In a machine as defined in claim 1, and further characterized in that said pulverizing means comprises a housing to receive said coarse particles, a roller having cutting blades disposed around its periphery mounted centrally of said housing, and radially disposed blades mounted in said housing with their cutting edges adjusted closely adjacent the cutting blade edges of said roller.

5. In a machine for reclaiming tinned metal waste pieces, such as tin cans, tin plate scrap and the like, by transforming the same into finely comminuted material to be formed into alloyed billets containing tin and other metal such as steel, which comprises means for compressing and reducing said pieces to relatively flat form; means for slitting said pieces in one direction, at interrupted diagonal intervals transversely thereof, to maintain said pieces in substantially intact condition; means for severing said slit pieces in a transverse direction of said slits to separate the same into a plurality of substantially coarse particles; and means for reducing said particles into relatively finely comminuted, substantially pulverized particles to be alloyed into said billets, all of the recited means being so cooperatively and correlatively, associated, arranged and constructed such that said pieces are compressed and reduced to relatively flat form, said pieces in relatively flat form are slit in one direction at interrupted diagonal intervals transversely thereof, said slitted pieces are severed in a transverse direction of said slits to separate the same into a plurality of substantially coarse particles and said coarse particles are reduced into relatively finely comminuted, substantially pulverized particles.

6. In a machine for reclaiming tinned metal waste pieces, such as tin cans, tin plate scrap and the like, by transforming the same into finely comminuted material to be formed into alloyed billets containing tin and other metal, such as steel, which comprises means for compressing and reducing said pieces to relatively flat form; means for slitting said pieces in one direction, at interrupted diagonal intervals transversely thereof, to maintain said pieces in substantially intact condition; means for severing said slit pieces in a transverse direction of said slits to separate the same into a plurality of substantially coarse particles; means for reducing said particles into relatively finely comminuted, substantially pulverized particles to be alloyed into said billets; and delivery and receiving means cooperatively associated with each of the foregoing means and with each other to convey said pieces, while being slit, severed and transformed into coarse and fine particles, in a continuous path to be collected for alloying, all of the recited means being so cooperatively and correlatively, associated, arranged and constructed such that said pieces are compressed and reduced to relatively flat form, said pieces in relatively flat form are

slit in one direction at interrupted diagonal intervals transversely thereof, said slitted pieces are severed in a transverse direction of said slits to separate the same into a plurality of substantially coarse particles, said coarse particles are reduced into relatively finely comminuted, substantially pulverized particles and sad pieces while being slit, severed and transformed into coarse and fine particles are delivered and received for compressing and reducing into flat form, delivered and received for slitting, delivered and received for severing, delivered and received for reducing into fine particles, in a continuous path.

7. In a machine as defined in claim 6, and further characterized in that said last named means includes a first conveyer and a hopper respectively to transmit and receive said flat pieces automatically to be fed by the latter into the slitting means; a second conveyor, disposed substantially normal to said first conveyer, and a hopper respectively to transmit and receive said slit pieces automatically to be fed by the latter into the severing means to reduce said slit pieces into coarse particles; and a third conveyer, similarly disposed as the second conveyer, and a hopper respectively to transmit and receive said particles to be fed by the latter into the pulverizing means.

8. In a machine for reclaiming tinned metal waste pieces, such as tin cans, tin plate scrap and the like, by transforming the same into finely comminuted material to be formed into alloyed billets comprising tin and other metals, which comprises first means for compressing and reducing said pieces to relatively flat form; second means for slitting said pieces in one direction transversely, at interrupted diagonal intervals, to hold said pieces in substantially intact condition; third means for severing said slit pieces in a transverse directon to separate the same into a plurality of substantially coarse particles; fourth means for reducing the bulk of said particles into fines; and fifth means for separating the remaining coarse particles from the fines and returning the same to said fourth means likewise to be reduced to fines, whereby only fines can be collected for alloying the same into billets, all of the recited means being so cooperatively and correlatively, associated, arranged and constructed such that said pieces are compressed and reduced to relatively flat form, said pieces are slit in one direction transversely, at interrupted diagonal intervals, said slit pieces are severed in a transverse direction to separate the same into a plurality of substantially coarse particles, the bulk of said severed pieces are reduced into fine particles, the said coarse particles are separated from the said fine particles and returned to be reduced into fine particles.

9. In a machine as defined in claim 8, and further characterized in that said first means comprises two smooth surfaced, relatively adjustable compression cylinders, resiliently mounted, each having meshed ring gears at adjacent ends, motor driving means for rotating said rollers in opposite directions under pressure, and speed reduction means cooperatively connecting said motor with said ring gears.

10. In a machine as defined in claim 8, and further characterized in that said second means comprises two opposed cylindrical rollers, each provided with circular, spaced-apart slitting knives interleaved with each other, each of said knives on one of said rollers forming a complete circle, and each of said knives on said other roller forming segments of a circle, the same being spaced at intervals along helical lines around said other roller.

11. In a machine as defined in claim 8, and further characterized in that said fourth means comprises a vertically disposed cylindrical housing; an elongated cylindrical roller having a plurality of closely spaced, parallel, helically arranged cutting blades around its periphery, mounted to rotate coaxially of said housing; and a plurality of elongated, radially disposed cutting blades vertically mounted in said housing with their cutting edges adjusted closely adjacent said helical blades substantially throughout their lengths.

12. In a machine as defined in claim 8, and further characterized in that said third means comprises two cylindrical rollers, each of which is provided with circular severing knives spaced from each other, and the knives of the one roller being interleaved with the knives of the other roller, whereby to sever said slit pieces into coarse particles.

13. In a machine as defined in claim 8, and further characterized in that said fifth means includes a conveyer to collect said fines and coarse particles intermingled with each other as they come from said fourth means; means to separate said fines from said coarse particles; means to dispense said fines into containers for alloying the same; and means to return said coarse particles to said fourth means to be reduced into fines.

14. In a machine according to claim 13, and wherein said fines separating means includes a fines screen, and said dispensing means includes a hopper, said screen being mounted in the top of said hopper.

15. In a machine according to claim 13, and wherein said conveyor is inclined to project a substantial distance above said fourth means to dump said fines and coarse particles onto a separator, and wherein said means for returning said coarse particles comprises a gravity slide conveyer connected at its top to said separator and at its bottom to said fourth means, whereby to receive said coarse particles and re-route the same to said fourth means.

16. In a machine of the character described, the improvement comprising a slitting mechanism for flattened pieces of tinned sheet metal for the ultimate purpose of pulverizing and alloying the same into an alloyed product of tin and steel, said mechanism including two cylindrical rollers, each provided with circularly arranged, spaced apart slitting knives adapted to be interleaved with each other, each of said knives on one of said rollers forming a complete circle, and each of said knives on said other roller forming segments of a circle, the same being spaced at intervals to form grooves along helical lines around said other roller, so cooperatively and correlatively, associated, arranged and constructed such that said pieces are slitted transversely along parallel spaced lines at diagonally interrupted intervals to hold said pieces intact.

17. In a machine of the character described, the improvement comprising a mechanism for reducing coarse particles of tinned sheet metal to finely comminuted particles substantially to pulverize the same into fines for the ultimate purpose of alloying the same into an alloyed product of tin and steel, said mechanism including a vertically disposed cylindrical housing; an elongated cylindrical roller having a plurality of closely spaced, parallel, helically arranged cuting blades around its periphery, mounted to rotate coaxially of said housing; and a plurality of elongated, radially disposed cutting blades vertically mounted in said housing with their cutting edges adjusted closely adjacent said helical blades substantially throughout their lengths.

18. In a method of reclaiming tinned metal waste pieces, such as tin cans, tin plate scrap, and the like, comprising the following steps: compressing and reducing said pieces to relatively flat pieces; simultaneously slitting said cans transversely thereof with a plurality of slits in one direction at interrupted intervals to hold them intact; severing said pieces transversely of said slits to separate them into a plurality of substantially coarse particles; and substantially pulverizing said particles and placing the same in a metal container.

19. In a method of reclaiming tinned metal waste pieces, such as tin cans, tin plate scrap, and the like, comprising the following steps: compressing and reducing said pieces to relatively flat pieces; simultaneously slitting said pieces transversely thereof with a plurality of slits in one direction at interrupted intervals to hold them intact; severing said pieces transversely of said slits to separate them into a plurality of substantially coarse particles; substantially

pulverizing said particles and placing the same in a metal container; heating the container and contents to the approximate fusion temperature until the same is malleable; and forming the same into a billet alloy of said tin and metal.

20. In a method of reclaiming tinned metal waste pieces, such as tin cans, tin plate scrap, and the like, comprising the following steps: compressing and reducing said pieces to relatively flat pieces; simultaneously providing a plurality of slits in said pieces in spaced parallel relation in one direction thereof, at interrupted diagonal intervals to hold them intact; severing said pieces transversely of said slits to separate the same into a plurality of substantially coarse particles; shearing said particles until the bulk thereof is reduced to fines intermingled with the coarse particles; separating the coarse particles from the fines and further shearing the same into fines; and mixing all of the fines together so that the same can be formed into an alloy of said tin and metal.

21. A machine for reducing coarse particles of metal into finely comminuted particles substantially pulverized, comprising a vertically disposed housing, a cylindrical roller having a plurality of cutting blades arranged around its periphery, mounted to rotate coaxially of said housing; and a plurality of radially disposed cutting blades vertically mounted in said housing with their cutting edges adjacent said blades throughout their lengths.

22. The subject matter as claimed in claim 21, wherein

said cutting blades around the periphery of said cylindrical roller are helically arranged thereon.

23. The subject matter as claimed in claim 21, wherein said plurality of radially disposed cutting blades are vertically mounted in said housing with their cutting edges adjusted closely adjacent said cylindrical roller blades substantially throughout their lengths.

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1,779,916	Paup	Oct. 28, 1930
1,793,613	Hoefling	Feb. 24, 1931
2,036,207	Feddern	Apr. 7, 1936
2,222,073	Hauge	Nov. 19, 1940
2,234,105	Ashton	Mar. 4, 1941
2,355,079	Jones	Aug. 8, 1944
2,540,883	Hopkins	Feb. 6, 1951
2,575,057	Keiper	Nov. 13, 1951
2,583,862	Lichenstein	Jan. 29, 1952
2,881,472	Wilson	Apr. 14, 1959