Aug. 9, 1932. E. S. LINCOLN 1,870,336

SHEET FEEDING APPARATUS

Filed June 11, 1930 5 Sheets-Sheet 1

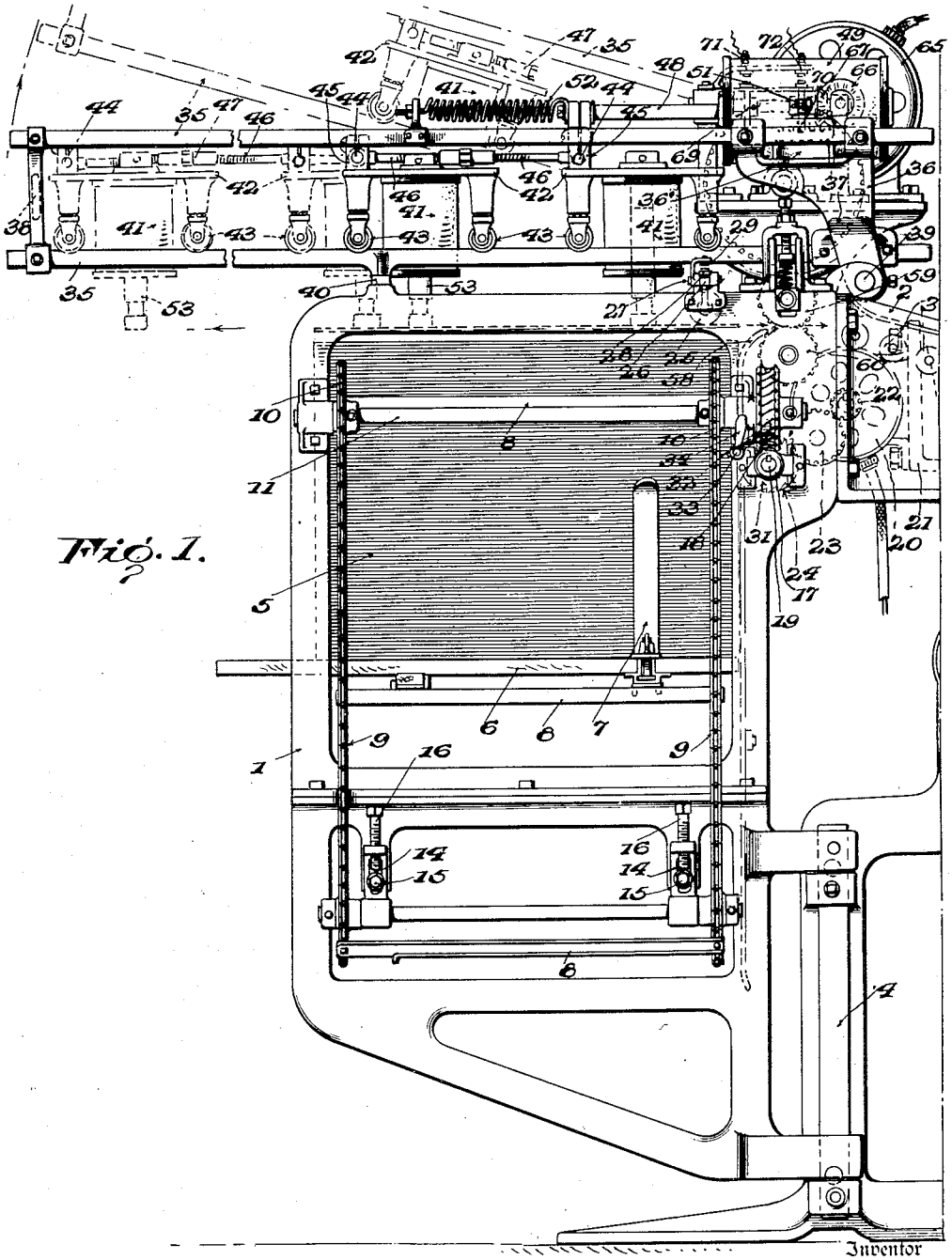


FIG. 1.

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SHEET FEEDING APPARATUS

Filed June 11, 1930 5 Sheets-Sheet 2

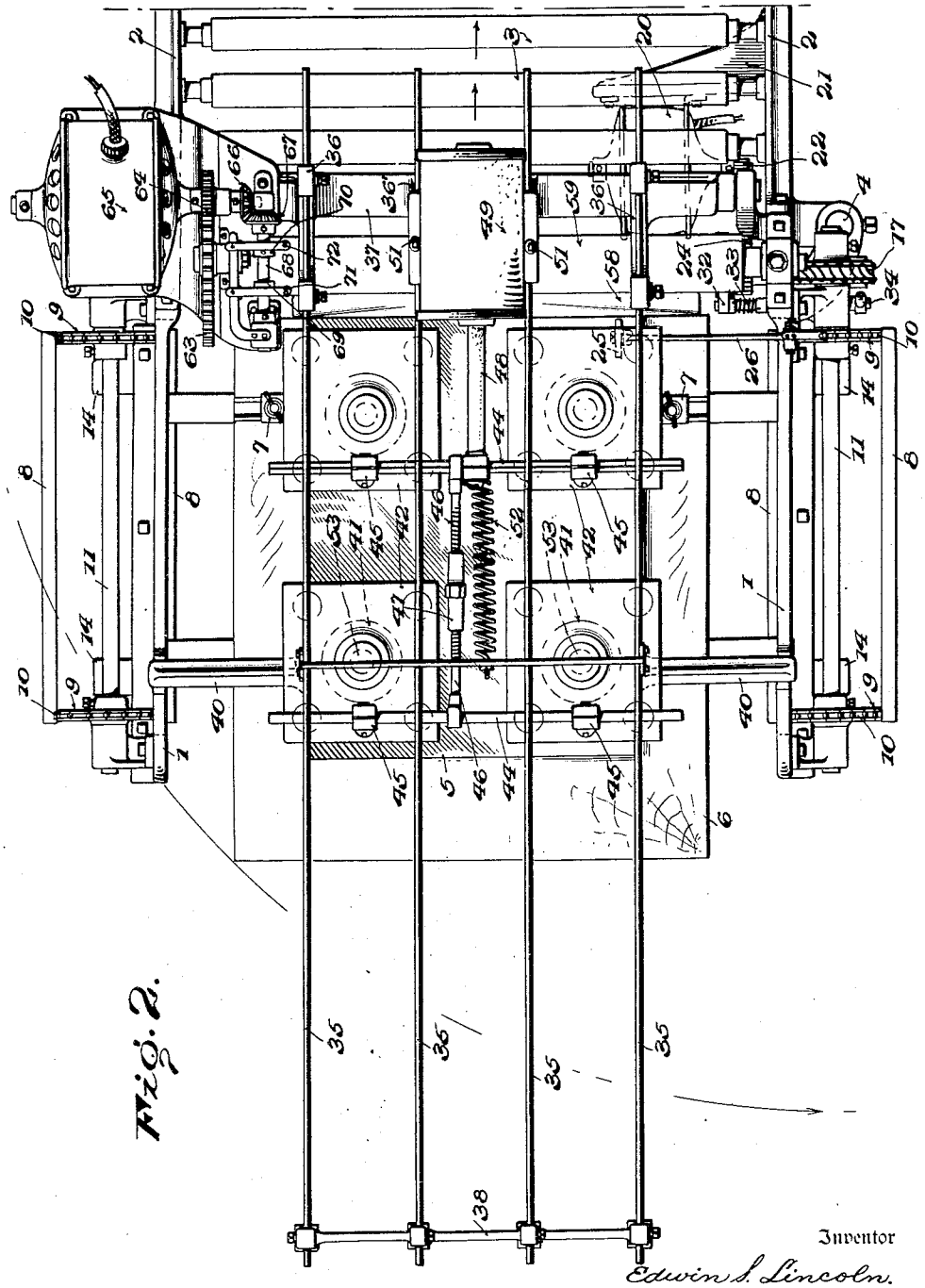


Fig. 2.

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SHEET FEEDING APPARATUS

Filed June 11, 1930 5 Sheets-Sheet 3

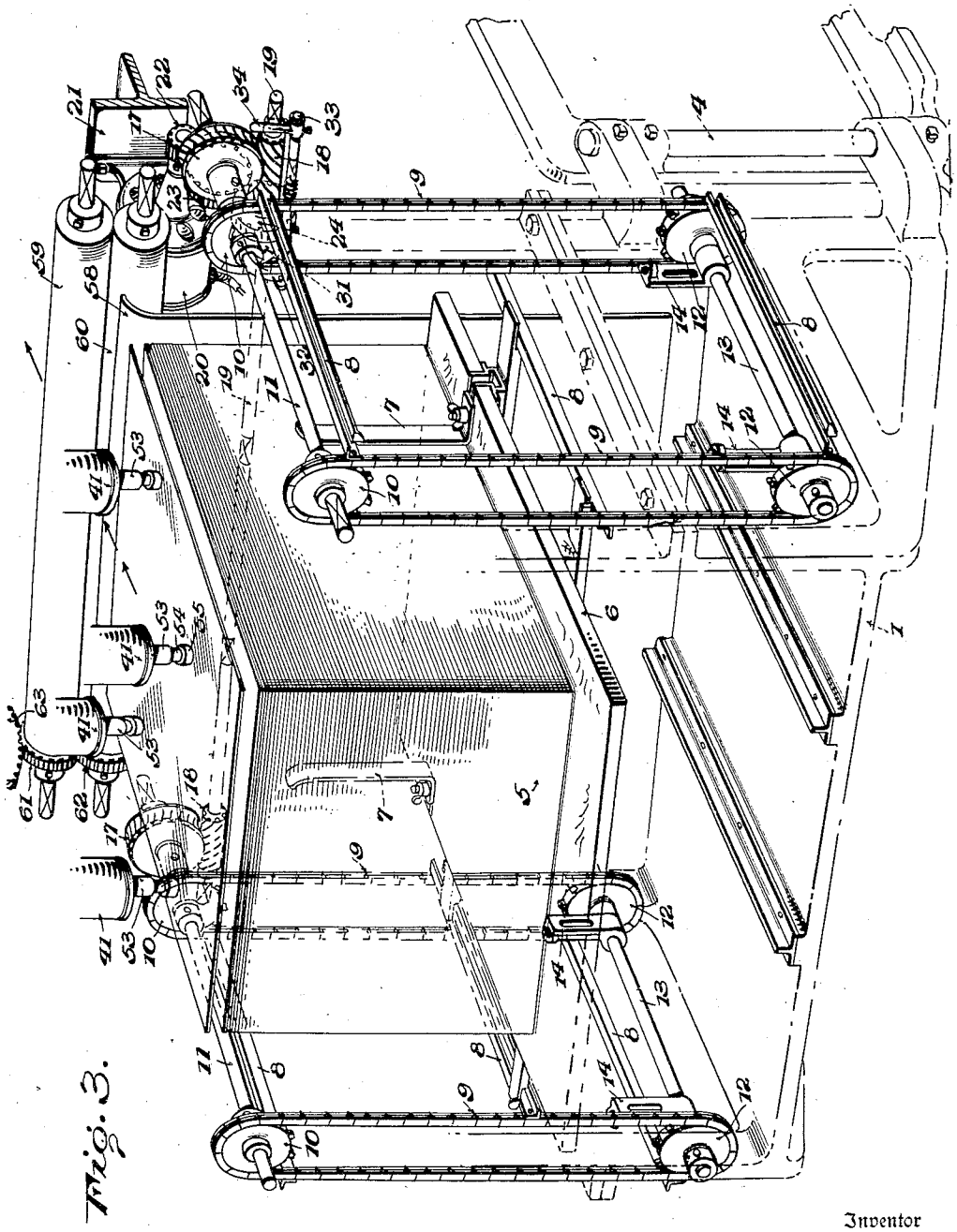


Fig. 3.

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SHEET FEEDING APPARATUS

Filed June 11, 1930 5 Sheets-Sheet 4

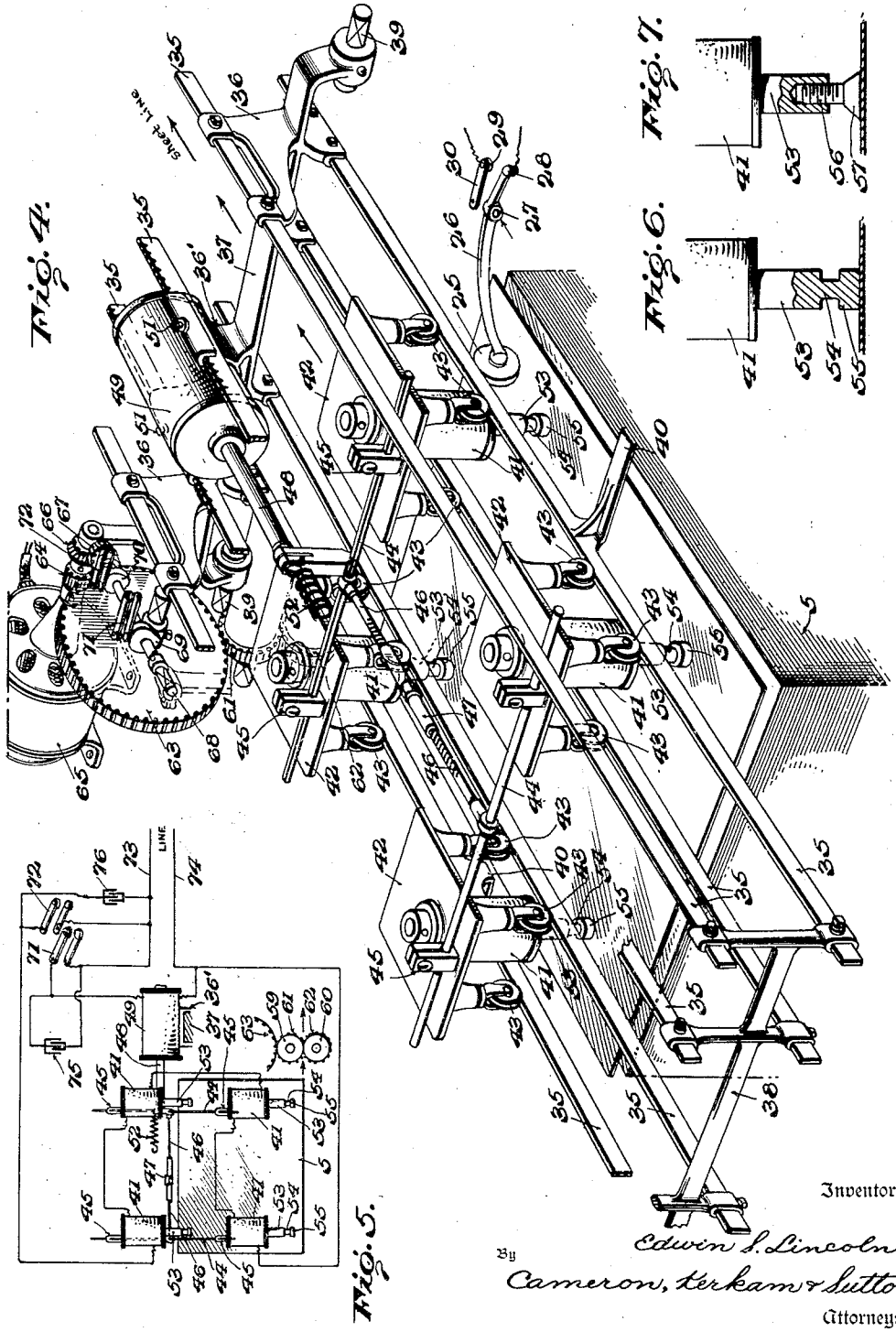


Fig. 4.

Fig. 5.

Fig. 7.

Fig. 6.

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SHEET FEEDING APPARATUS

Filed June 11, 1930 5 Sheets-Sheet 5

Fig. 8.

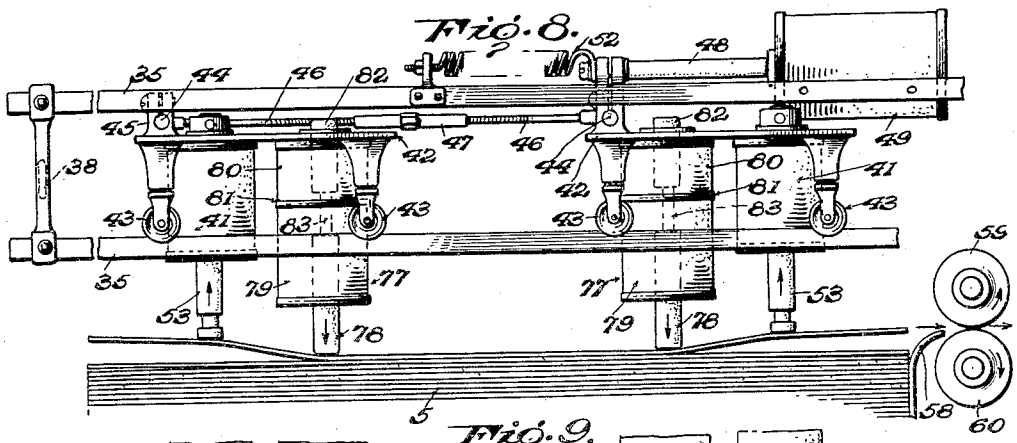


Fig. 9.

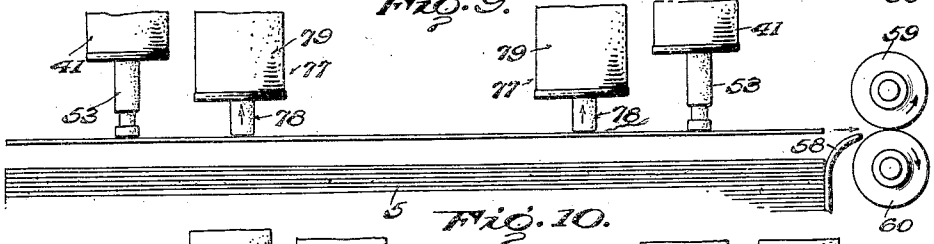


Fig. 10.

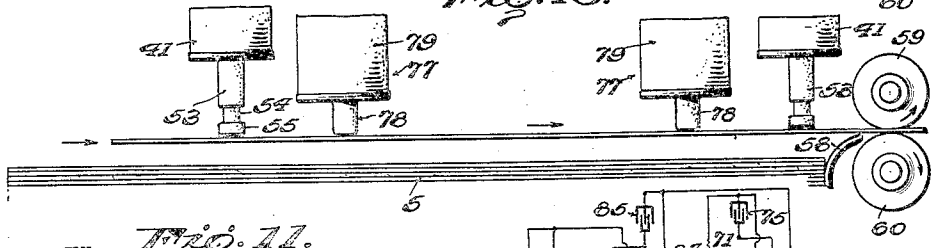


Fig. 11.

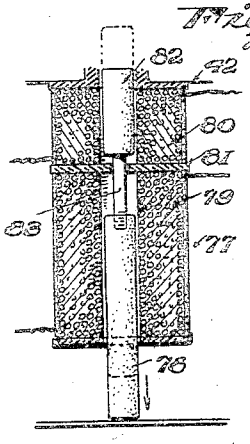
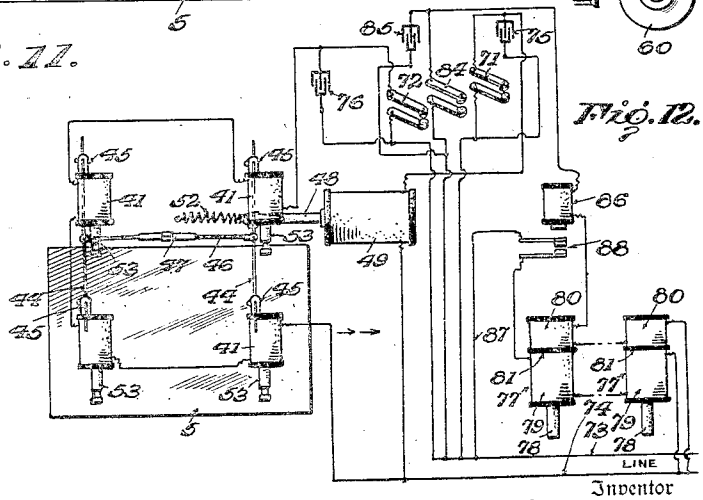


Fig. 12.



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Patented Aug. 9, 1932 1,870,336

UNITED STATES PATENT OFFICE

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SHEET FEEDING APPARATUS

Application filed June 11, 1930. Serial No. 460,527.

This invention relates to means for lifting and separating sheets one by one from a stack or pile of such sheets, and more particularly to means for separating and lifting sheets of magnetic material.

Heretofore in magnetic sheet separating apparatus considerable difficulty has been experienced in preventing the picking up of more than one sheet at a time. Due to the fact that the metallic sheets, of tin, for example, stick together until air is admitted between them, the second sheet tends to be carried up with the top sheet. Moreover, the lines of force of the lifting magnet tend to pass through the top sheet into the second sheet and to lift the latter also. However, it has been found that when the intensity of the magnetic field is reduced to the point where penetration is positively prevented, the lifting power of the magnet is too small to lift the sheets. For these reasons, among others, it has heretofore proved inpracticable to obtain reliable and efficient separation of individual sheets by means of lifting magnets.

One of the objects of this invcention is to provide novel magnetic sheet separating means which may be operated at relatively high speeds and which will reliably separate and lift individual sheets one by one from a stack or pile.

Another object is to provide novel magnetic sheet lifting means adapted to prevent the penetration of the magnetic flux through more than one sheet.

A further object is to provide novel sheet separating means adapted both to separate and lift the top sheet from a stack of sheets and to forward the sheet to feed it off the stack.

A still further object is to provide novel sheet separating means embodying means to lift a portion of a sheet while holding down an adjacent portion whereby the sheet is flexed and the separation thereof from the next adjacent sheet is facilitated.

Another object is to provide novel sheet separating means embodying means for lifting a portion of a sheet while holding down an adjacent portion to flex the sheet and then releasing the holding down means and lifting the entire sheet bodily from the stack.

Other objects are to provide a novel lifting solenoid and a novel combined holding down and lifting solenoid.

Other objects will appear more fully hereinafter as the description of the invention proceeds.

Several embodiments of the invention are illustrated in the accompanying drawings, but it is to be expressly understood that these drawings are for purposes of illustration only and are not to be construed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In said drawings:

Fig. 1 is a side elevation of an apparatus embodying the invention;

Fig. 2 is a plan view of said apparatus;

Figs. 3 and 4 are perspective views of the apparatus, parts being removed for the sake of clearness;

Fig. 5 is a wiring diagram;

Figs. 6 and 7 illustrate forms of lifting solenoids;

Figs. 8, 9 and 10 are diagrammatic views showing various positions in the operation of another embodiment of the invention;

Fig. 11 is a section through a combined holding down and lifting solenoid; and

Fig. 12 is a wiring diagram for the embodiment shown in Figs. 8, 9 and 10.

While the separating and feeding mechanism constituting the invention is broadly adapted for and may be employed in the separation and feeding of sheets for any purpose, the drawings show the invention embodied in an apparatus for separating the feeding sheets of magnetic material, such as tin, from a stack to a feed or conveying table. Accordingly, a supporting frame 1 of any suitable construction and material, whereby the separating and feeding mechanism is supported, is associated with a feed table 2 of any suitable type that is provided with conveying rollers 3. As shown, the frame 1 is pivoted on a pin 4 so that the separating and feeding mechanism may be swung into and out of operative relation with

said feed table. A stack or pile of sheets 5, of suitable magnetic material, such as tin, is supported by a table 6 that is preferably provided with suitable side register devices 7. The table 6 is carried by an elevating mechanism of any suitable type, and in the form shown, rests on flights 8 secured to elevator chains 9, the latter passing over and being driven by sprocket wheels 10 mounted on a pair of shafts 11, one at each side of the frame. The lower ends of the chains 9 pass over sprocket wheels 12 mounted on a pair of shafts 13 which rotate in adjustable brackets 14 secured to the frame 1 by set screws 15. The tension of the sprocket chains 9 may be adjusted by means of bolts 16.

For the purpose of rotating the sprocket wheels to drive the elevator chains, each of the shafts 11 preferably carries a worm gear 17 meshing with a worm 18, the latter being mounted on a common shaft 19 that rotates in bearings formed on the frame 1. Any suitable means may be employed to rotate the shaft 19 to elevate the table 6, and in the form shown, an electric motor 20 that is suitably mounted on a bracket 21 constituting a part of the frame of the feed table 2 carries a pinion 22 on its shaft meshing with an idler 23 which in turn drives a pinion 24 on the shaft 19. The motor 20 is preferably controlled automatically in order to maintain the top sheet of the stack in proper elevation, and accordingly a roller 25 that is adapted to rest upon the top of the stack is carried at one end of an arm 26 pivoted to the frame 1 to 27 and carrying at its other end a contact 28 cooperating with a stationary contact 29 that is carried by an arm 30 likewise secured to the frame 1. Contacts 28 and 29 are connected in the circuit of motor 20, so that as the height of the stack decreases, the roller 25 falls until contacts 28 and 29 close, whereupon motor 20 is energized to elevate the table 6 until contacts 28 and 29 open. Thus the elevation of the top sheet of the stack is automatically maintained within proper limits. Table 6 is maintained in its elevated position by means of a ratchet 31 on the shaft 19 with which cooperates a pawl 32 that is carried by a shaft 33 rotatably mounted in the frame 1 and provided on its outer end with a handle 34. It is to be expressly understood, however, that the above described pile elevating mechanism and the operating and control mechanism therefor are shown for purposes of illustration only and constitute no part per se of the present invention.

Suitable means are provided for lifting and separating the top sheet from the pile and then for forwarding the lifted top sheet to feed it off the pile. When the sheets are of magnetic material, said means preferably take the form of a plurality of horizontally movable solenoid coils, each having a vertically movable solenoid plunger or case which lift the sheet when the coils are energized. The solenoids may be mounted in any suitable manner, and in the form shown are slidably mounted on a framework constituted by a plurality of rails 35 that are secured at their forward ends in brackets 36 formed in a cross member 37 and are connected together at their rear ends by a suitable cross piece 38. Preferably the framework constituted by the rails 35 and cross members 37 and 38 is pivoted to the frame 1 at its forward end by means of pivot pins 39 mounted in suitable bearings formed in said frame, and the lower outer rails 35 are provided with laterally extending arms 40 adapted to rest on the frame 1 to support the rear portion of said framework. A plurality of solenoids 41 which, as shown, are four in number, are each secured in any suitable manner to a plate 42 that is provided with a plurality of rollers 43 resting on the lower rails 35. The plates 42 are connected in pairs by suitable means such as cross bars 44 passing through suitable clamps 45 mounted on the plates 42. The forward and rear pairs are joined together by means of rods 46 provided with a turnbuckle 47, whereby the distance between the forward and rear pairs of solenoids can be adjusted for different sheet lengths. All of the solenoids 41 are thus mounted on a traveling carriage constituted by the interconnected plates 42 rolling by means of rollers 43 on the rails 35. Said carriage may be moved back and forth on said rails in any suitable manner and preferably is forwarded by means of a solenoid plunger 48 operated by a solenoid 49 that is hung by means of bracket 36′ between two central upper rails 35, the top surfaces of said rails being preferably notched or serrated and set screws 51 provided to maintain the solenoid 49 in any desired position relative to said rails. The traveling carriage may be retracted by suitable means such as a spring or springs 52.

Each of the solenoids 41 is provided with a plunger 53 that is lifted when the coils 41 are energized to lift the top sheet from the stack. The solenoid plungers 53 preferably have the form shown in Figs. 6 and 7 in order to prevent the penetration of the magnetic flux through the top sheet of the pile. As shown in Fig. 6 a plunger 53 is provided adjacent its ends which contacts with the sheet with a portion 54 of reduced diameter and with an enlarged head 55. The portion 54 can be made of sufficient cross sectional area that the magnetic flux which will pass through it before it becomes saturated is sufficient to hold the sheet in contact with the head 55 when the plunger 53 is lifted. This flux, however, is distributed by the head 55 over a larger sheet area sufficient to prevent penetration of the flux through the top sheet to the

next adjacent sheet. At the same time the total power of the solenoid 41 is effective to lift the plunger 53, such portion of the magnetic flux as will not pass through the neck 54 due to saturation leaking back to the solenoid 41 without passing through the sheet. In Fig. 7, the same result is obtained by tapping the end of the plunger 53 and threading therein a screw 56 having an enlarged head 57 adapted to contact with the sheet.

When the sheet has been lifted by the plungers 53 and fed forwardly by the traveling carriage and the solenoid 49, the front edge of the lifted sheet passes over a curved guide plate 58 and is engaged by a pair of feed rollers 59, 60 whereby it is fed forwardly to the rollers 3 on the feed table 2. Feed rollers 59, 60 are driven by intermeshing gears 61 and 62 respectively carried on their ends, the gear 61 meshing with an idler 63 that is driven by a pinion 64 on the shaft of an electric motor 65 suitably mounted on the frame 1. Preferably, this motor 65 is also adapted to operate a plurality of contacts controlling the circuits of the various solenoids, and, as shown, a bevel gear 66 on the motor shaft meshes with a bevel gear 67 on one end of a shaft 68, the latter carrying a pair of cams 69 and 70 which are adapted to close pairs of contacts 71 and 72 respectively in a manner known to the art.

The operation of the apparatus will be understood from the above description, taken in connection with Fig. 5 illustrating the wiring connections for the solenoid. Assuming the traveling carriage to be retracted by means of the spring 52 until the solenoids are positioned over the pile, the cam 70 acts to close the contacts 72 which closes a circuit (Fig. 5) from the line wire 73 through the contacts 72 and through each of the solenoids 41 in series to the line wire 74. Solenoids 41 are thus energized to lift the plungers 53 which carry with them the top sheet from the pile due to their magnetic attraction, as above described. As soon as the top sheet has been separated and lifted, cam 69 acts to close the contacts 71 whereby a circuit (Fig. 5) is completed from the line wire 73 through the contacts 71 and solenoid 49 to the line wire 74 and the traveling carriage is pulled forwardly against the tension of spring 52. The lifted top sheet is thereby forwarded bodily and fed off the pile, the front edge of the sheet passing over the curved guide plate 58 and into engagement with the rotating feed roller 59, 60 which grip the sheet and feed it to the table 2. Just as the sheet is engaged by said feed rollers, or shortly thereafter, the cams 69 and 70 permit the contacts 71 and 72 to open, thereby freeing the sheet from the action of the magnetic means and permitting the springs 52 to retract the traveling carriage into position to pick up the next sheet. Preferably contacts 71 and 72 are shunted by suitable condensers 75 and 76 respectively to prevent arcing of the contacts when the circuit is broken. The rollers 59 and 60 having fed the lifted sheet from the pile, the contacts 72 are again closed by the cam 70 to lift the next sheet and the operation continues as before, the stack of sheets being automatically elevated by means of the motor 20 and roller 25 as above described. Preferably, the feed rollers 59 and 60 are operated at fairly high speed in order to remove the sheets quickly from the pile.

In some instances it is desirable to provide for flexing or bending the sheets as they are separated from the pile, in order to admit air between the sheets and to prevent the second sheet from sticking to the top sheet and being lifted with it. Preferably additional magnetic means are provided for this purpose and may comprise solenoids having plungers that are positioned adjacent the lifting solenoids and are forced downwardly against the sheet as the plungers 53 are lifted. Such an embodiment of the invention is illustrated diagrammatically in Figs. 8 to 12 wherein a plurality of holding down solenoids 77 are provided, one solenoid 77 preferably being secured to each plate 42, although the number and location of the holding down solenoids may be varied to suit conditions. The plungers 78 of the holding down solenoids 77 are held downwardly against the sheet as shown clearly in Fig. 8 as the plungers 53 are lifted, whereby the corner portions of the top sheet are bent or flexed to initially separate the top sheet from the next adjacent sheet and to admit air between the same. Thereafter, the plungers 78 may be released by deenergizing the solenoids 77, whereupon the entire sheet will be lifted as above described.

Preferably, however, and as illustrated in Figs. 8 to 12, the solenoids 77 have a combined holding down and lifting action. That is, after the top sheet has been bent or flexed at its corners, as illustrated in Fig. 8, the action of the solenoid 77 is reversed and the plungers 78 become additional lifting plungers and aid in lifting the top sheet as shown in Fig. 9. This combined action of solenoids 77 may be accomplished in any suitable manner, as for example, by a double coil solenoid as illustrated in section in Fig. 11. The solenoid 77 comprises two coils 79 and 80, separated by a plate 81 of suitable non-magnetic material such as brass. The plunger 78 is adapted to be operated by the lower coil 79, and the plunger 82 by the upper coil 80, these plungers being mechanically connected in any suitable way as by means of a rod 83 preferably of non-magnetic material passing freely through an opening in the plate 81. When the upper coil 80 is energized, the plunger 82 is pulled into the coil whereby the plunger 78 is positively held downward

against the sheet as shown in Fig. 8. As soon as the corners of the sheet have been bent or flexed by the lifting action of the plungers 53, coil 80 is deenergized and coil 79 is energized, whereupon plunger 78 is pulled upwardly into the solenoid and the magnetic attraction of the plunger 78 is effective to aid in lifting the top sheet as shown in Fig. 9. The traveling carriage is then moved forwardly to feed the front edge of the sheet between the feeding rollers 59 and 60, as shown in Fig. 10.

The operation of this apparatus will be understood from the above description taken in connection with Fig. 12 showing the wiring diagram for the magnetic circuits. The four magnetic circuits, namely, the circuits of the solenoids 41, 49, 79 and 80 may be controlled by suitable contacts operated in timed relation by cams mounted on the shaft 68, as described above in connection with Figs. 1 to 5, and obviously the mode of operation and the timing of the various circuits can be varied to provide any desired operation. In the preferred arrangement, as shown in Fig. 12, only three sets of contacts are employed and the operation is as follows. The four lifting solenoids 41 are in series with a pair of contacts 72 shunted by a condenser 76, the circuit being connected across the mains 73 and 74, as described above. The solenoid 49 is in series with contacts 71 and condenser 75 across the mains 73, 74. A third circuit extends from main 73 through a third pair of contacts 84 shunted by a condenser 85 to the coil 86 of a relay and then through the coils 80 of the holding down magnets to the main 74. A wire 87, connected to the main 73, leads to relay contacts 88 associated with relay coil 86 and then through coils 79 of solenoids 77 to the main 74. The relay is of such type that when coil 86 is energized, the contacts 88 are held open and when coil 86 is deenergized, contacts 88 close by gravity or other means, relays of this type being well known in the art.

In operation, assuming the traveling carriage to be retracted by the spring 52 so that the solenoids are in position over the stack of sheets, contacts 72 and 84 are closed practically simultaneously. This completes the circuit through the lifting solenoids 41, and at the same time energizes coil 86 of the relay and the coils 80 of the combined holding down and lifting solenoids 77. The coils 79 of solenoid 77 are, however, not energized due to the fact that the relay coil 86 maintains the contacts 88 open. As the plungers 53 are lifted, the corners are bent or flexed to effect the initial separation of the top sheet of the stack. As soon as this is accomplished contacts 84 are opened, whereby coil 86 of the relay and the coils 80 of the solenoids 77 are deenergized, contacts 88 close, and coils 79 of solenoids 77 are energized so that the plungers 78 pick up the sheets as shown in Fig. 9. During this operation, contacts 72 can be kept closed so that plungers 53 assist in holding the sheet up, or they may be opened to leave the lifting action to the plungers 78. As soon as the sheet has been lifted, as shown in Fig. 9, contacts 71 close, energizing solenoid 49 which pulls the traveling carriage forward to place the front edge of the sheet in engagement between the feed rollers 59 and 60 as heretofore described. The sheet is then fed forwardly to the feed table 2. Contacts 88 may remain closed as the sheet is being pulled forwardly by the rotating feed rollers so that said sheet does not drop back on the pile, but is maintained elevated and pulled off the plungers 78, so that scratching of the sheets on the pile is prevented as the top sheet is fed forwardly off the pile. Thereafter, contacts 71 open and solenoid 49 is deenergized so that the traveling carriage is returned by springs 52, and as soon as sufficient time has elapsed for the sheet to be removed, contacts 72 and 84 are again closed, thereby deenergizing the coils 79 by opening the contacts 88, and the operation goes on as before.

The apparatus described is simple and economical since it involves no complicated mechanical construction, nor any delicate precise adjustments, and since there are no parts which are apt to get out of order and cause service difficulties. At the same time, the separation, lifting and feeding of the sheets is reliable and may take place at a very rapid rate. The form of the lifting solenoid plungers effectively prevents penetration of the magnetic flux through the top sheet so that there is little or no attractive effort exerted on the second sheet of the stack. The action of the holding down magnets, combined with the lifting solenoids having plungers of the form described, insures positive separation of the sheets one by one from the top of a stack, while the lifting action is made more positive by the additional lift afforded by the combined holding down and lifting magnet, whereby the sheets may be lifted bodily from the stack and maintained out of engagement therewith while it is being fed off the stack. Obviously any suitable number and arrangement of solenoids can be employed, depending upon the size and nature of the sheets that are to be fed, and likewise the traveling carriage may be forwarded by mechanical means if desired.

While only two embodiments of the invention have been described and illustrated in the drawings, it is to be expressly understood that the invention is not limited thereto but is capable of a wide variety of mechanical expressions, and also that changes may be made in the form, construction, and arrangement of parts without departing from the spirit of the invention. Reference is there-

fore to be had to the appended claims for a definition of the merits of the invention.

What is claimed is:

1. Apparatus of the class described comprising the combination of magnetic lifting means for lifting a portion of a sheet, magnetic means for simultaneously holding down an adjacent portion to flex the sheet, and means for lifting the entire sheet bodily.

2. Apparatus of the class described comprising the combination of magnetic means for separating a portion of a sheet from a supply, means for simultaneously holding an adjacent portion of the sheet against the supply to flex the sheet, means for bodily separating the entire sheet from the supply, and means for moving the separated sheet away from said supply.

3. Apparatus of the class described comprising the combination of means for separating a portion of a sheet from a supply, magnetic means for simultaneously holding an adjacent portion of the sheet against the supply to flex the sheet, means for releasing said holding means after the sheet is flexed, and means for moving the sheet away from the supply.

4. Apparatus of the class described comprising the combination of magnetic lifting means for lifting a portion of a sheet, means for simultaneously holding down an adjacent portion to flex the sheet, and means for lifting the held down portion, whereby the entire sheet is lifted.

5. Apparatus of the class described comprising the combination of magnetic means for separating a portion of a sheet from a supply, magnetic means for simultaneously holding an adjacent portion of the sheet against the supply to flex the sheet, means for thereafter separating the last named portion of the sheet from the supply, whereby the entire sheet is separated therefrom, and means for moving the separated sheet away from said supply.

6. Apparatus of the class described comprising the combination of magnetic lifting means for lifting a portion of a sheet, means for simultaneously holding down an adjacent portion to flex the sheet, means for releasing said holding down means, and means for lifting the held down portion of the sheet, whereby the entire sheet is bodily lifted.

7. In apparatus of the class described, the combination of magnetic lifting means for lifting a portion of a sheet, means for simultaneously holding down an adjacent portion to flex the sheet, means for releasing said holding down means, means for lifting the held down portion of the sheet, whereby the entire sheet is lifted, and means for bodily forwarding the lifted sheet.

8. In apparatus of the class described, the combination of lifting means for lifting a portion of a sheet, magnetic means for simultaneously holding down an adjacent portion to flex the sheet, means for deenergizing the holding means after the sheet is flexed, and means for forwarding the sheet.

9. In apparatus of the class described, the combination of magnetic means for lifting a portion of a sheet, magnetic means for simultaneously holding down an adjacent portion to flex the sheet, and magnetic means for lifting the held down portion whereby the entire sheet is lifted.

10. In apparatus of the class described, the combination of magnetic lifting means for lifting a portion of a sheet, magnetic means for simultaneously holding down an adjacent portion to flex to sheet, magnetic means for lifting the held down portion whereby the entire sheet is lifted, and means for bodily forwarding the lifted sheet.

11. In apparatus of the class described, the combination of magnetic lifting means for lifting a portion of a sheet, magnetic means for simultaneously holding down an adjacent portion to flex the sheet, means for deenergizing said holding down means, and magnetic means for thereafter lifting the held down portion of the sheet, whereby the entire sheet is lifted.

12. In apparatus of the class described, the combination of magnetic lifting means for lifting a portion of a sheet, magnetic means for simultaneously holding down an adjacent portion to flex the sheet, means for deenergizing said holding down means, magnetic means for thereafter lifting the held down portion of the sheet whereby the entire sheet is lifted, and means for bodily forwarding the lifted sheet.

13. Apparatus of the class described, comprising in combination lifting means for lifting a portion of a sheet, magnetic means for holding down an adjacent portion of said sheet, and means for reversing the action of said holding down means to lift the sheet.

14. Apparatus of the class described, comprising in combination magnetic means for lifting a portion of a sheet, magnetic means for holding down an adjacent portion of said sheet, means for reversing the action of said holding down means to lift the entire sheet, and means for bodily forwarding the lifted sheet.

15. Apparatus of the class described, comprising in combination means for lifting a portion of a sheet to flex the sheet, means for thereafter lifting the remainder of the sheet, and means for moving said lifting means away from the stack to carry the lifted sheet bodily from the stack.

16. Apparatus of the class described comprising in combination magnetic means for lifting a portion of a sheet to flex the sheet, magnetic means for thereafter lifting the sheet bodily from the stack, and means for moving said magnetic means away from the

stack to carry the lifted sheets bodily from the stack.

17. In apparatus of the class described, the combination of a support movable in a horizontal direction, a magnet carried thereby, a magnetic member movable relative to said support in a vertical direction to lift a sheet when said magnet is energized, and means for moving said support to carry the sheet from the stack.

18. In apparatus of the class described, the combination of a support movable in a horizontal direction, a magnet coil carried thereby, a plunger slidable in said coil to lift a sheet when said coil is energized, and means for moving said support to carry the sheet from the stack.

19. In apparatus of the class described, the combination of a support, a plurality of magnets carried by said support, movable magnetic cores for said magnets, means for energizing said magnets to lift said cores whereby the top sheet is lifted bodily from the stack, and means for moving said support to carry the sheet from the stack.

20. In apparatus of the class described, the combination of a lifting magnet and a movable core for said magnet adapted to lift a sheet when said magnet is energized, said core having a head and a portion of reduced diameter adjacent said head.

21. Magnetic lifting means comprising a magnet coil and a movable core therefor, said core having an enlarged head adapted to contact the body to be lifted and a portion of reduced diameter immediately adjacent said head.

22. In apparatus of the class described, a magnet having a plurality of coils and a movable core therefor, one of said coils being adapted to displace said core in one direction, and the other coil being adapted to displace said core in the opposite direction.

23. A combined holding down and lifting magnet comprising a magnet having a plurality of coils axially adjacent one another, and a common movable core for said coils, said core comprising a plurality of magnetic elements connected by a non-magnetic member.

24. In apparatus of the class described, the combination of a rolling carriage, magnetic means carried thereby for lifting a sheet from a stack, and a solenoid for moving said carriage to feed the sheet off the pile.

25. In apparatus of the class described, the combination of a horizontally traveling carriage, magnetic means carried thereby for lifting a sheet from a pile, a magnet for moving said carriage to carry the sheet from the pile, and means for energizing said magnets in timed relation.

26. In apparatus of the class described, the combination of a magnet for lifting a portion of a sheet, a magnet for holding down an adjacent portion of the sheet to flex the sheet, a magnet for thereafter lifting the portion held down, and means for energizing said magnet in timed relation.

In testimony whereof I have signed this specification.

EDWIN S. LINCOLN.

CERTIFICATE OF CORRECTION.

Patent No. 1,870,336. August 9, 1932.

EDWIN S. LINCOLN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 36, for "to" read at; and line 120, for "ends" read end; page 5, line 81, claim 10, for "to" second occurrence, read the; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of November, A. D. 1932.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)