D. DAVIES.

APPARATUS FOR SEPARATING AND FEEDING SHEETS TO COLD ROLLS, PICKLING, TINNING, GALVANIZING, AND LIKE MACHINES.

APPLICATION FILED DEC. 27, 1915.

1,316,430.

Patented Sept. 16, 1919.

5 SHEETS—SHEET 1.

Fig. 2.

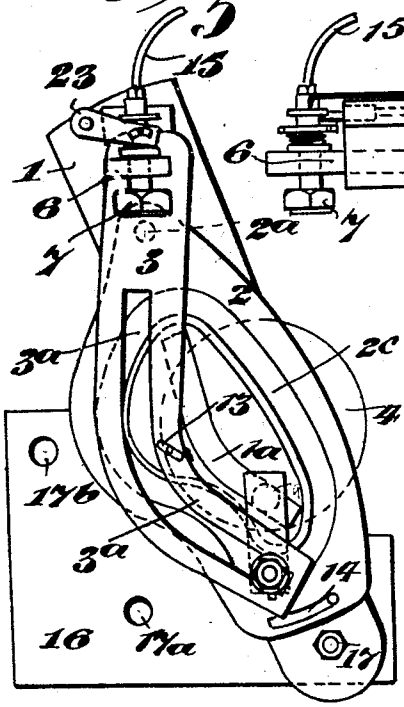


Fig. 1.

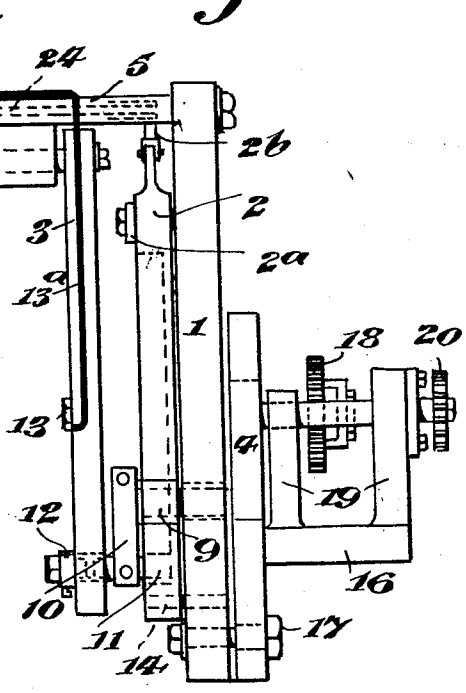


Fig. 3.

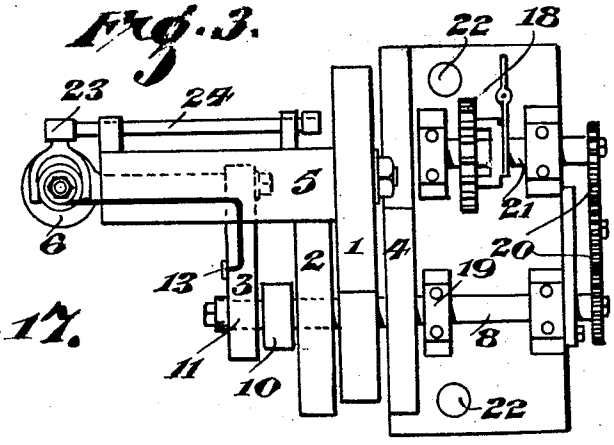
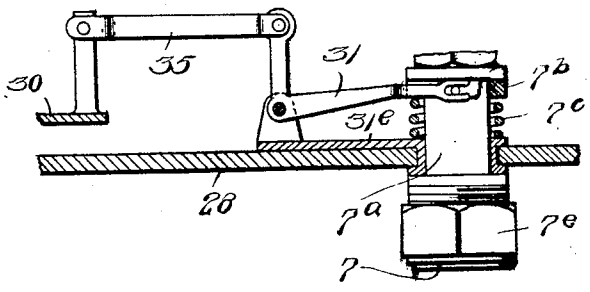


Fig. 17.



Inventor:
David Davies
By: B. Singer
Atty

D. DAVIES.

APPARATUS FOR SEPARATING AND FEEDING SHEETS TO COLD ROLLS, PICKLING, TINNING, GALVANIZING, AND LIKE MACHINES.

APPLICATION FILED DEC. 27, 1915.

1,316,430.

Patented Sept. 16, 1919.

5 SHEETS—SHEET 2.

Fig. 4.

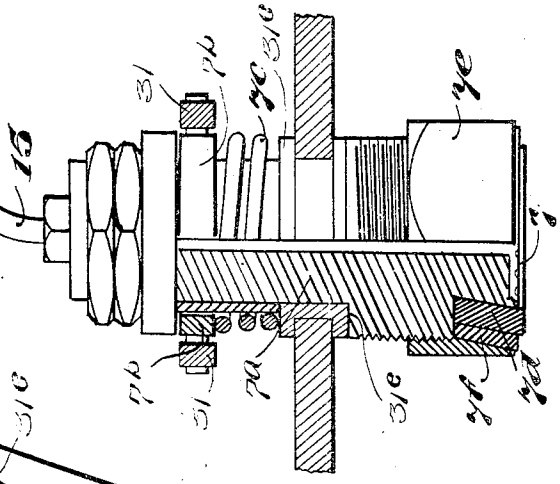
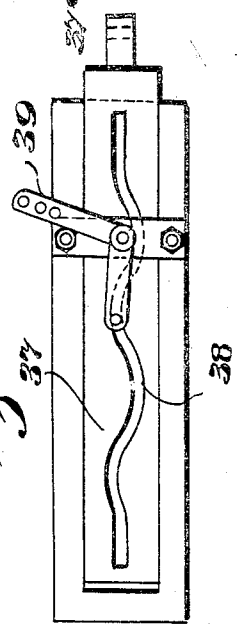


Fig. 8.



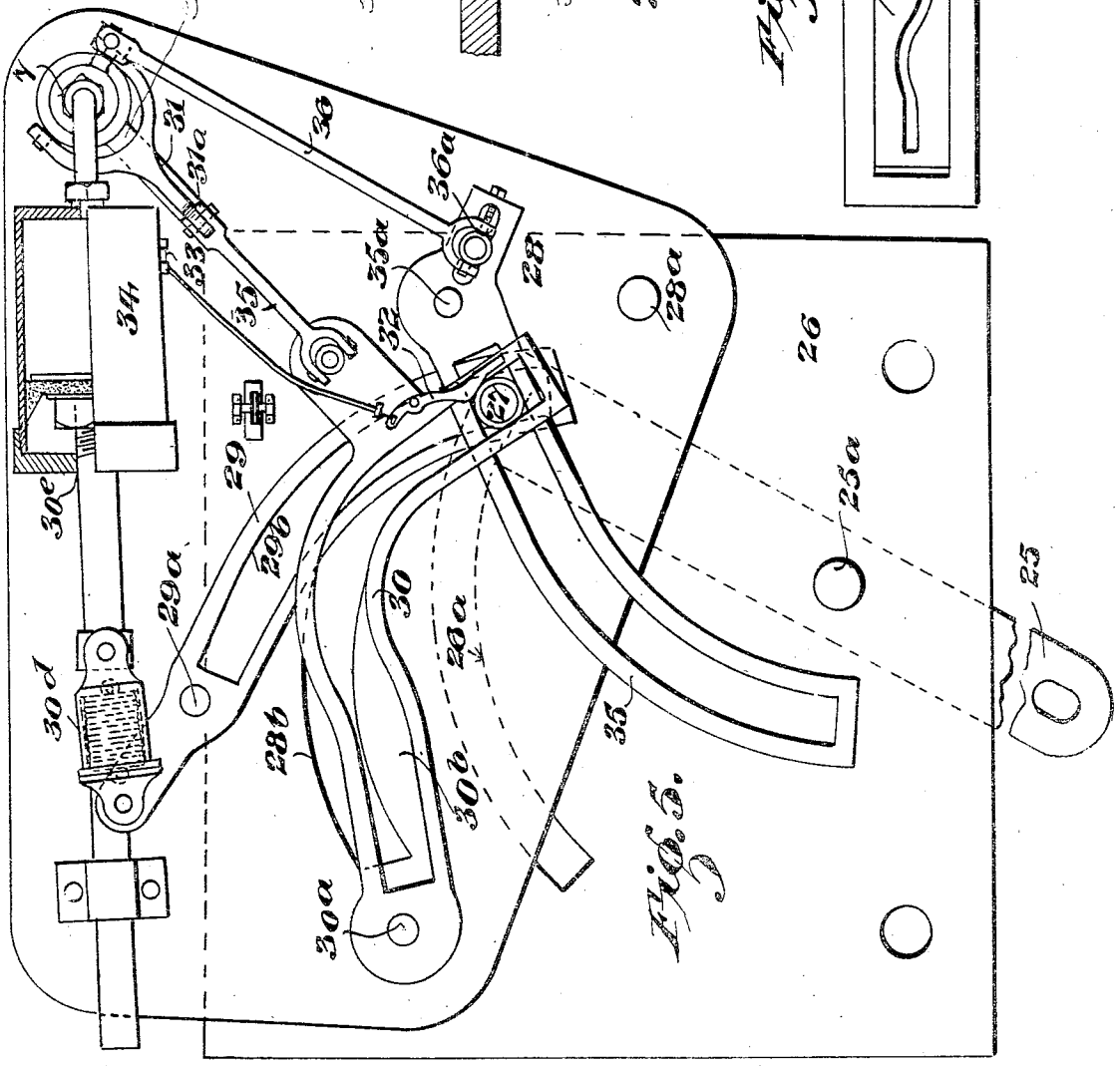


Fig. 5.

Inventor
David Davies
By P. B. Smyth Atty

D. DAVIES.

APPARATUS FOR SEPARATING AND FEEDING SHEETS TO COLD ROLLS, PICKLING, TINNING, GALVANIZING, AND LIKE MACHINES.

APPLICATION FILED DEC. 27, 1915.

1,316,430.

Patented Sept. 16, 1919.

5 SHEETS—SHEET 3.

Fig. 6.

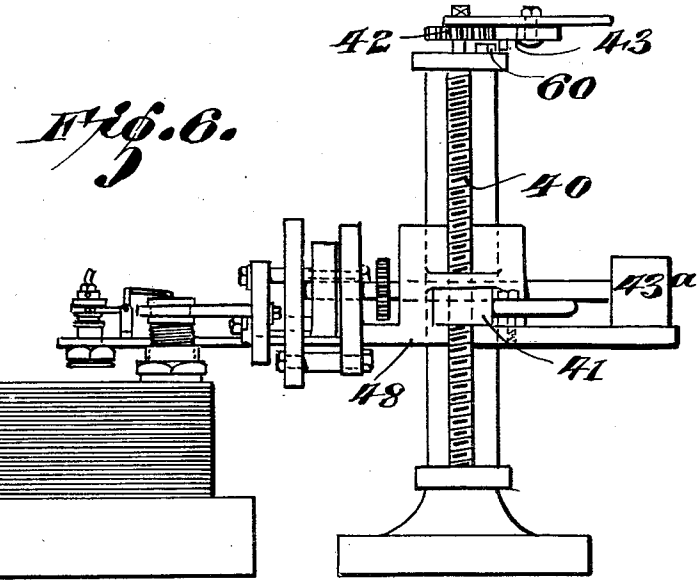
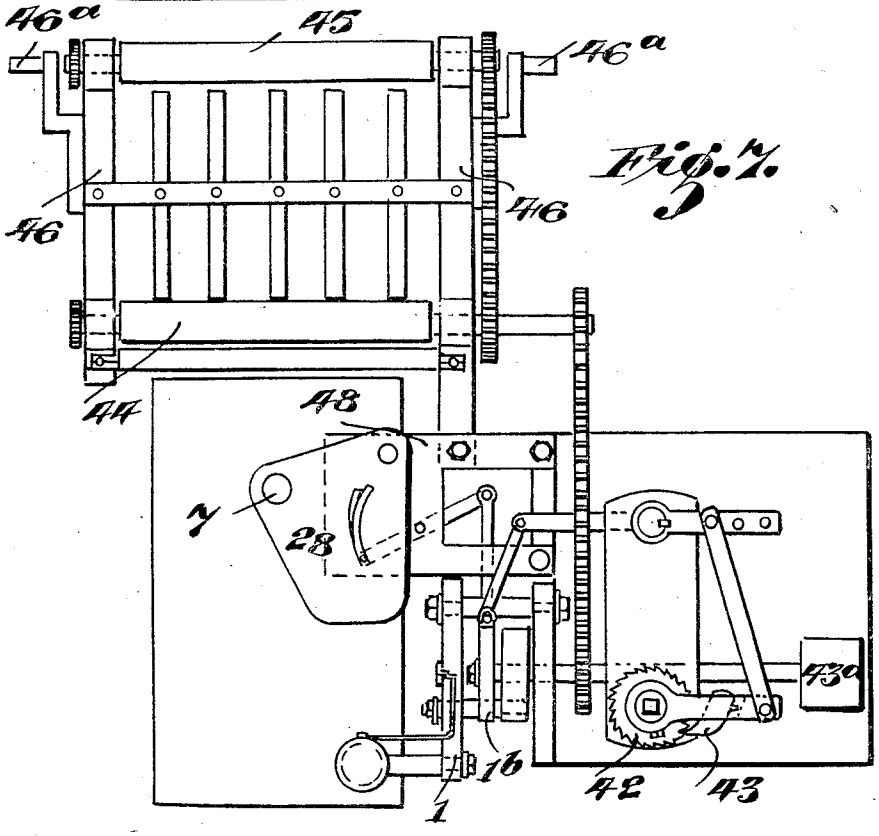


Fig. 7.



Inventor
David Davies
By B Smigel
Atty

D. DAVIES.

APPARATUS FOR SEPARATING AND FEEDING SHEETS TO COLD ROLLS, PICKLING, TINNING, GALVANIZING, AND LIKE MACHINES.

APPLICATION FILED DEC. 27, 1915.

1,316,430. Patented Sept. 16, 1919.

5 SHEETS—SHEET 4.

Fig. 9.

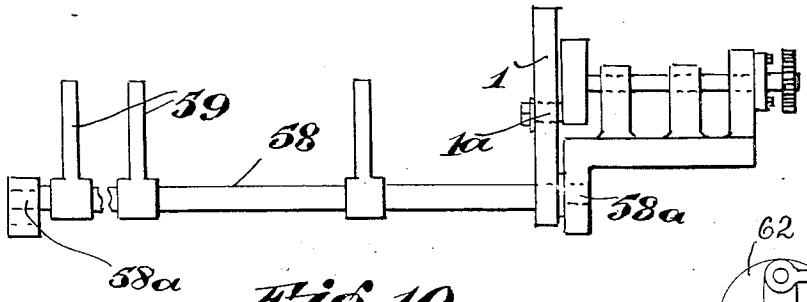
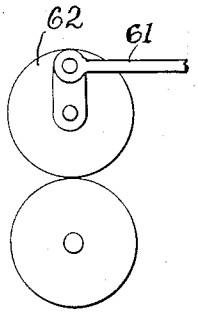


Fig. 10.



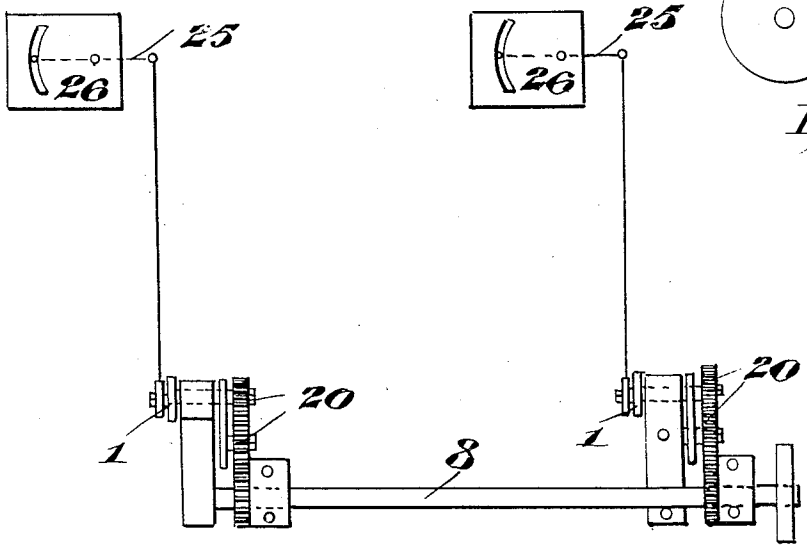


Fig. 16.

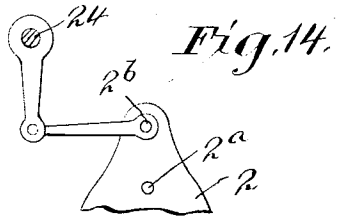


Fig. 14.

Inventor-
David Davies
By D. Dingee
Atty

D. DAVIES.

APPARATUS FOR SEPARATING AND FEEDING SHEETS TO COLD ROLLS, PICKLING, TINNING, GALVANIZING, AND LIKE MACHINES.

APPLICATION FILED DEC. 27, 1915.

1,316,430.

Patented Sept. 16, 1919.

5 SHEETS—SHEET 3.

Fig. 12.

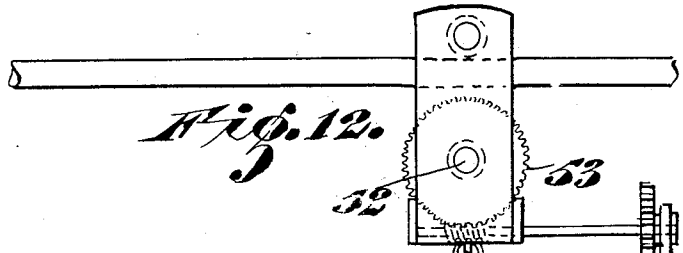
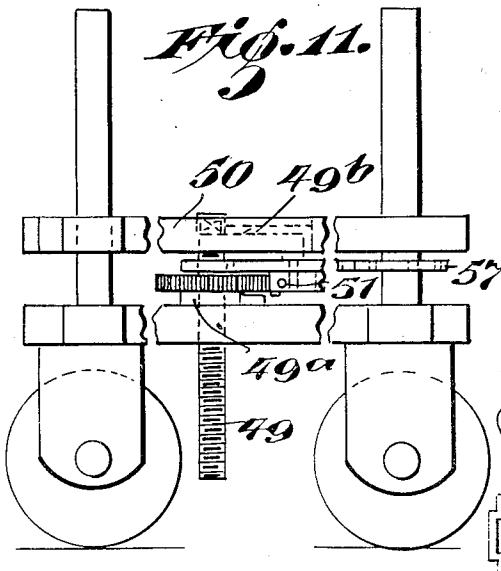
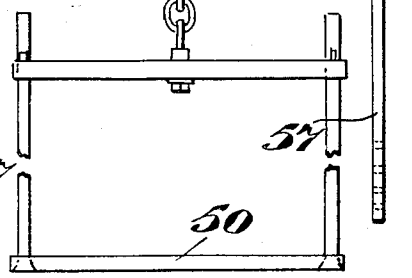


Fig. 11.





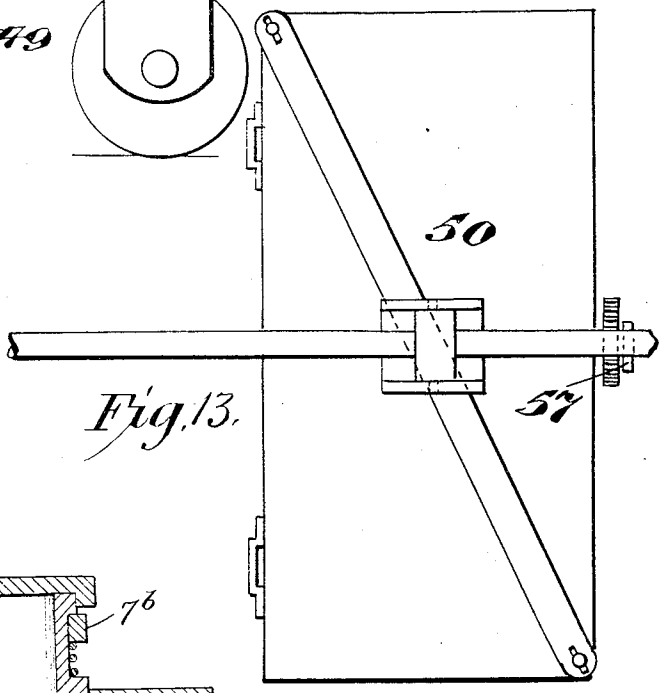
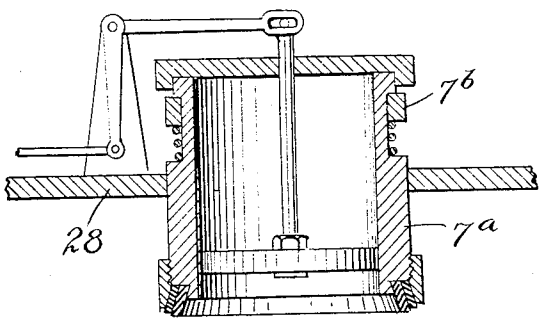


Fig. 13.

Fig. 15.



Inventor.
David Davies
By. W. Owen Atty

UNITED STATES PATENT OFFICE.

DAVID DAVIES, OF LLANELLY, WALES.

APPARATUS FOR SEPARATING AND FEEDING SHEETS TO COLD ROLLS, PICKLING, TINNING, GALVANIZING, AND LIKE MACHINES.

1,316,430. Specification of Letters Patent. Patented Sept. 16, 1919.

Application filed December 27, 1915. Serial No. 68,817.

To all whom it may concern:

Be it known that I, DAVID DAVIES, a subject of the Kingdom of Great Britain, residing at Llanelly, in the county of Carmarthen, South Wales, have invented certain Improvements in or Relating to Apparatus for Separating and Feeding Sheets to Cold Rolls, Pickling, Tinning, Galvanizing, and like Machines, of which the following is a specification.

This invention relates to apparatus for separating and feeding sheets in connection with cold rolls, pickling, tinning, galvanizing and like machines, of the type in which the sheets are raised and fed by a suction carrier having a reciprocating action, and in connection with which it has been proposed to successively elevate the pile of sheets through the medium of a screw worm operated from the suction carrier mechanism by a pawl and ratchet wheel, the present improvements comprising an arrangement whereby upon the carrier being pressed upon the sheet, vacuum is established in the carrier through the medium of an exhaust pump action, which is operated and controlled by the feed mechanism, after which the sheet is fed forward by a rapid stroke toward the end of which, the power of the vacuum is released, and the carrier returns by a comparatively slow action to the original position ready for depression upon the next sheet in connection with which provision is made to accommodate or adjust the varying level of the pile of sheets when on the delivering trolley or a tray either by successively lowering the carrier in combination with means for directing the sheets from the successively varying levels into the position required, or by successively raising the pile of sheets on the trolley or tray, and in both cases through the medium of mechanism which is readily attached to and detached from driving mechanism.

The vacuum may be provided from a separate exhaust pump which is connected to the carrier by a flexible tube or the carrier itself may be formed of a cylinder and piston which are so operated by lever connections from the feeding mechanism as to provide the vacuum and release it at the required time.

The action of feeding the sheet and operating the vacuum force in the case of a carrier in which the vacuum is produced by a separate pump may be obtained through the direct connection of the carrier to a rocking lever which is operated by a rotating cam, while in the case of the carrier, the action of which produces the vacuum, the feeding and vacuum actions are provided by a reciprocating motion. In either case these motions may be effected in cases where working rolls are used by the provision of means whereby the action of the carrier can be obtained from the rotation of one of the working rolls, or such action can be obtained from a separate shaft, or from a suitably constructed machine which may be self contained with its own motor.

The varying level of the pile of sheets with regard to the working rolls or other machine to which they are fed, may be provided for by lowering the carrier and its operating mechanism at required intervals and providing two pairs of supplementary rolls in a frame, one end of which frame is pivoted so that the nip of the one pair of supplementary rolls is on a level with, and opposite the nip of the working rolls, while the other end of the frame bearing the other pair of supplementary rolls, the nip of which is substantially opposite the top sheet to be fed is connected to, and falls with that part of the machine upon which the carrier is mounted.

Another method of accommodating the varying level of the sheets consists of successively raising the pile of sheets prior to the feeding of the sheets into the working rolls or machine, and such successive raising of the pile may be effected by mechanism provided upon or below the trolley, by which the pile is supported, such mechanism being operated by a reciprocating lever which is capable of easy connection and disconnection with the mechanism on the trolley, and which is preferably operated from, and may act in conjunction with the means for operating the feeding action of the vacuum carrier, the successive lowering action of the carrier in this case not being required.

In order that this invention may be clearly understood and more readily carried into practice, I have appended hereunto five sheets of explanatory drawings, upon which:—

Figure 1 is a front elevation showing one form of mounting and operating the carrier.

Fig. 2 is a side elevation of Fig. 1.

Fig. 3 is a plan of Fig. 1.

Fig. 4 is a part section and part elevation through one form of carrier.

Fig. 5 is a plan showing another form of mounting and operating the carrier.

Fig. 6 is an elevation showing one form of machine for effecting the feed and for successively lowering the carriers in the course of the feeding operation.

Fig. 7 is a plan of Fig. 6.

Fig. 8 is a plan of a slide through the medium of which a reciprocating actuation of the carrier is obtained from a rotary drive.

Fig. 9 is an elevation showing a means whereby a series of carriers may be operated from one rocking lever.

Fig. 10 is a plan of another means whereby a series of carriers may be operated from one drive, and in which the operation of each carrier may be varied to suit varying sizes of sheets to be fed.

Fig. 11 is an elevation of a trolley illustrating a modification in the arrangement for successively bringing the sheets into position for being fed.

Fig. 12 is an elevation of a further modification in the means for successively bringing the sheets into the feeding position.

Fig. 13 is a plan of Fig. 12.

Figs. 14, 15, 16 and 17 are details of construction disclosed in Figs. 5 and 6.

In an embodiment of this invention, and referring to one method for obtaining the automatic supporting and passing of the several sheets of a pile through working rolls or into other machines, a crank disk 4, Figs. 1, 2 and 3, is provided on the end of a revolving shaft 8 running parallel to the working rolls, and driven through a series of three interchangeable cog wheels 20, from the second parallel shaft 21, which in turn receives its motion either independently from a motor 43^a, Fig. 7, or directly from the rolls or machine through the medium of any suitable gearing. The gear 20 is made interchangeable so that the speed of the carrier may be varied to suit the length of the sheets to be fed and insure the beginning of one sheet to immediately follow the end of the other through the rolls.

The shafts 8 and 21 are mounted in suitable bearings 19, a driving clutch 18 being provided on the shaft 21, the holes 22 in the bed plate being arranged for bolting upon a suitable stand.

This disk 4 is provided with a projecting stud or roller 9, this roller or projection engages in the slot 1^a of a rocking lever 1 which is pivoted about a fulcrum 17 attached to the base plate 16 of the machine at a point preferably below the disk spindle, so that in operation the curve of the travel and the vertical movement of the carrier 7 as hereafter described, causes the depression of the carrier to be sufficient to adhere and when raised effect both the separation and feed in case of sheets of light weight, but in cases of heavier sheets, the point of attachment 17 of the fulcrum lever can be adjusted to positions such as 17^a or 17^b, in which case the vertical travel of the carrier 7 would be increased and the feed stroke decreased, the feed being then effected by another carrier with a full horizontal action as hereafter described with regard to Figs. 6 and 7.

The rotation of the disk gives a suitable rocking motion in the direction in which the sheets are required to travel, and from the end of the rocking lever 1 a projecting arm 5 is fixed to extend at right angles to its plane of motion to a suitable distance over the pile of plates, and upon this arm the carrier 7 is mounted, which carrier is of tubular formation and fitted with a gripping seat of rubber or other suitable material, so as to be capable of forming an air tight joint with the sheet when pressed thereon.

The slot 1^a is so shaped as in operation to cause the carrier to remain stationary prior to the commencement of the forward stroke, and by varying the shape of this slot 1^a in the rocking lever 1 the period in which the carrier remains stationary prior to the commencement of the forward stroke can be varied.

For effecting the lifting or raising of the carrier 7 the cam or lever 2 is provided, this cam being pivoted to the rocking lever 1, at 2^a, and connected at 2^b through a link and arm with the spindle 24 which rotates in the projecting carrier arm 5, and operates the lever 23, so as to raise or lower the carrier by the reciprocating movement of the cam or lever 2, the movement of which is regulated by the roller pin 11 working in the cam groove 2^c said roller pin being mounted in the block 10 which is in turn fixed to the crank pin 9.

For the purpose of retaining the carrier in a vertical position during the stroke of the rocking lever, the lever 3 is provided and connected with the guide spindle 6, which is supported by the projecting carrier arm 5, this lever 3 being operated through the medium of the roller pin 11, so moving in the slot 3^a as to retain the carrier 7 in a practically constant vertical position. An adjustable lug 13 is mounted on the lever 3 and connected with the valve on the cylinder of the carrier, by means of a Bowden wire connection 13^a or an equivalent series of levers, the adjustable lug 13 being operated at the required time for opening and closing the valve by means of the projection 12′ upon the roller 12, which comes in contact with the adjustable lug 13 at the right time for admitting the air.

The carrier 7, Fig. 4, preferably consists of a cylindrical block 7^a which is mounted in the carrier plate 28, so as to be free to have a sliding action for the purpose of being brought into contact with the sheet, and

is provided with a sliding collar 7^b which is operated as hereinafter described with reference to Fig. 5. A spring 7^c is provided between the collar and the shoulder of the cylindrical part 7^a for the purpose of enabling the resilient nose of the carrier to adjust itself to the position of the sheet to be separated, and the vacuum chamber at the nose of the carrier is preferably provided with a rubber ring 7^d which is retained in position by the nut 7^e, a conical split metal ring 7^f being preferably provided between the nut 7^e and the rubber 7^d for the purpose of securing the rubber ring 7^d firmly in position.

The upper part of the tube of this carrier 7 is provided with a flexible connection 15 connecting at its other end with any suitable source of vacuum, controlling means being interposed in said connection 15 for allowing of the making and breaking of the exhaust within the carrier 7.

Instead of the carrier being mounted to have a semi-radial action as illustrated in Figs. 1, 2 and 3 on a rocking lever, it may be mounted to be operated by a lever 25, Fig. 5, which is pivoted on the one side of a base plate 26 at 25^a, the end of such lever having a projecting pin 27 which may be provided for the purpose of reducing friction with a roller which projects vertically through a guide slot 26^a in the base plate. About the end of the slot at a suitable point in the base plate, a carrier plate or lever 28 is pivoted at 28^a and provided with a slot 28^b which engages with the projecting pin 27, and at the other end of this carrier plate, the carrier 7 is fitted, the carrier in this case being similar to that previously described. A second lever 29 is pivoted at 29^a to a suitable point in the carrier plate, and is provided with a slot 29^b which engages with the vertical pin 27, a spring connection 30^d connecting the end of the second lever 29 to the plunger 30^e of a pump. At a suitable point on the carrier plate 28 a third slotted lever 30 is pivoted at 30^a, and is provided with a slot 30^b which also engages with the vertical pin 27, and is connected at one point to a bell crank lever 31, the pivot 31^a of which is supported from the carrier plate 28, the other end of the crank lever 31 being provided with a ring or fork which fits around the carrier cylinder in a similar manner to the arrangement shown by 7^b in Fig. 4, a spring such as 7^c being inserted between the ring and the bottom shoulder of the cylinder. An adjustable lug or lever 32 is provided on the third slotted lever 30 which lug or lever 32 is connected with a valve 33 on the cylinder 34 by means of a lever or wire 35 so as to release the sheet by admitting air at the required point.

It will be noted that I have made allowance for the slight swinging motion of the bell crank 31^a in a horizontal direction by means of mounting pivot lug 31^e upon a swinging support 31^d which is supported at its other end by means of a flanged ring member 31^e encircling the carrier 7.

The carrier 7, Fig. 4 may form a vacuum pump in itself, in which case the part 7^a is made hollow to form a cylinder, in which a plunger works, the cylinder being fitted with the rubber or other suitable material 7^d to form an air tight seat on the sheet, a spring 7^c being fitted between a shoulder on the cylinder, and a collar such as 7^b, while above the collar the plunger is operated by the lever 30, Fig. 5, the action being such that when the lever 30 is at or about the end of the return stroke a downward movement of the cylinder takes place, which movement is provided by the bell crank 31, thus bringing the grip carrier into contact with the sheet and forming an air tight seat between the carrier and sheet, after which the vacuum is formed by the raising of the plunger, the sheet being released at or near the end of the forward stroke by the downward movement of the plunger.

The spring connection 30^d may be contained within a pair of tubes which telescope one within the other for the purpose of adding additional rigidity to the spring connection.

The mechanism for effecting feed movement of the carrier is so arranged that the sheet is fed forward by a rapid stroke, and the carrier returns by a comparatively slow action to the original position ready for depression upon the next sheet.

The carrier 7 is so mounted on the carrier plate 28, as to be capable of partial rotation, by which means the twisting of the sheet while being carried forward is avoided, this partial rotation being regulated by slotted lever 35, which is pivoted to the carrier plate at 35^a and which is connected to the carrier by the rod 36, the connection 36^a to the lever 35 being made adjustable. It will be noted that the carrier 7 is retained in position by plate 28 in which it is adapted to have a sliding movement, and is held down to the sheet during the suction action of the piston by the downward pressure of the end of the lever 31 upon the collar which is around the cylinder.

The mode of operation is as follows:—

The reciprocation of the first lever 25 gives the carrier plate 28 a backward and forward oscillatory motion during a portion of the stroke, while the plunger lever 29 is so pivoted and slotted as to move during the whole length of the stroke, the lever 30 being so pivoted and slotted as to press the carrier 7 down on the sheet at or about the end of the return stroke, while immediately the gripping end of the carrier 7 is pressed down on the sheet, the bell-crank 31 on the

return stroke, *i. e.*, at the commencement of the reverse end of the stroke to that shown on the drawing commences to travel before the carrier starts on its forward stroke, the sheet being released prior to the finishing of the forward stroke by the admission of air into the cylinder 34.

Referring to Figs. 6 and 7, it will be seen that both the carrier which is mounted on the rocking lever 1, Figs. 1 to 3 and the carrier which is mounted on the carrier plate 28, Fig. 5, may be embodied in the same machine, in which case the carrier operated by the rocking lever first picks up and separates the sheet, which is then released, upon which the carrier on the carrier plate 28, picks up the sheet and carries it forward to the nip of the rolls, the carrier on the carrier plate being operated by another rocking lever 1^b which is in turn operated through the same crank pin as operates the carrier on the rocking lever 1.

For obtaining an oscillating motion of the feed lever from such as a crank connection 61 to one of the working rolls 62 of the machine to be fed, a grooved slide 37, Fig. 8, may be provided, one end 37^a being connected by a rod connection to the crank pin of the crank, so that the slide 37 is given a reciprocating movement, the groove 38 in this slide being provided with one or more cam formations. A pivoted lever 39 having a roller on one end engaging with the groove and having the other end connected to the end of the lever 25 Fig. 5 operating the carrier 7, is provided, by which means a number of reciprocating motions may be given the lever operating the carrier for each rotation of the rolls to be fed, the number of reciprocating actions being determined by the circumference of the rolls to be fed.

In the case of communicating the reciprocating movement to a series of carriers each of which is mounted to be operated by a lever 25 as shown by Fig. 5 for the purpose of separating and feeding a series of piles of sheets, a shaft 58 Fig. 9 mounted in suitable bearings is fixed to the lower part of the rocking lever 1 which lever is rocked by the crank action 1^a, the reciprocating action being communicated to the levers 25 by connecting rods from the ends of the arms 59.

It will be seen that this arrangement relates only to a series where the sheets are practically of the same size, but in cases where it is desired to feed a series in which the sheets are of such varying size that in the case of the smaller ones loss of time in the feeding would occur, provision is made as shown in Fig. 10 where a separate rocking lever 1 is provided to each feed mechanism, such rocking lever in each case being provided with separate interchangeable gear wheels 20 by which the feed may be varied as previously described.

The successive lowering of the carrier to meet the variation of the height of the pile of sheets may be effected through the medium of a center screw shaft 40, Figs. 6 and 7, with which a nut 41 engages, the vertical screw being operated through the medium of a ratchet wheel 42, with which a ratchet pawl 43, engages, and which pawl is preferably operated by means of a rocking eccentric or crank such as the rocking lever 1 which also operates the feed mechanism and which may in turn be operated either by such an arrangement as a connecting rod from a crank arranged on any convenient part of the working rolls or working parts of the machine to be fed, or from a motor 43^a which is self contained with the feeding apparatus.

In cases where the carrier 7 is successively lowered the varying level of the pile of sheets with regard to the working rolls or other machine to which they are fed is provided for through the medium of two or more pairs of supplementary rolls 44 and 45, in a frame 46, one end of which frame is pivoted at 46^a so that the nip of the one pair of supplementary rolls 45 is on a level with and opposite the nip of the working rolls, while the other end of the frame 46 bearing the other supplementary rolls 44, the nip of which is substantially opposite the sheet 47 to be fed, is connected to, and falls with that part of the machine 48, upon which the carrier is mounted.

Another method of accommodating the varying level of the sheet consists of successively raising the pile of sheets 47^a prior to the feeding of the sheets into the working rolls or machine, such successive raising of the pile being effected in the case of mechanism provided below the trolley tray 50 as shown in Fig. 11, through the medium of a screw worm 49 and nut 49^a and ratchet mechanism 57 as previously described, a handle 49^b being provided for working the screw 49 down, such handle when not in use being reversed and contained in a slot in the tray 50, or in the case of the mechanism being arranged above the trolley, or water tanks, Figs. 12 and 13, by the provision of an overhead shaft 52 carrying a sprocket wheel 53 which operates a chain 54 the upper end of which is secured to a drum attached to the sprocket wheel, which chain supports, and the action of which raises a tray 50 upon which the pile of sheets is placed, such trays 50 when containing piles of sheets for delivery to the rolls or machines being mounted on trolleys, or in case of separating and removing sheets from piles contained within a tank the piles of sheets and tray are contained in the tank, the separating and feeding apparatus in both cases working below the supporting cross bar to which the supporting chain 54

is connected. The pawl and ratchet mechanism 56 is operated by a lever connection to any suitable crank, the one end of such lever connection being capable of easy attachment to, and detachment from the lever 57.

A suitable curved projection 60 such as shown in Fig. 6 is provided in connection with the pawl and ratchet, and the position of this projection can be so adjusted on the fixed part of the machine that the pawl near the end of its own motion as also at the beginning of the creeping stroke may be capable of non-engagement of one or more teeth of the ratchet before engaging permanently, thus enabling the carrier or pile or sheets to be moved in accordance with the varying sheets.

What I claim as my invention, and desire to secure by Letters Patent is:—

1. Separating and feeding apparatus including a carrier comprising a mechanical motion and a sheet engaging member secured thereto, the said mechanical motion being adapted to impart a slow projecting and a quickly retracting stroke to said sheet engaging member, and a suction engaging member which is adapted to have a separately operated sliding action in relation to the carrier which supports the suction engaging member.

2. Separating and feeding apparatus including a carrier in communication with a source of vacuum and adapted to separate, pick up a sheet of material and convey it a certain distance and to then release said sheet, and means adapted to engage said sheet to convey it farther, said means comprising a plate capable of oscillating motion in a horizontal plane, a sheet engaging member mounted upon the free end of said plate, and a suction engaging member which is adapted to have a sliding movement in relation to the said carrier.

3. Separating and feeding apparatus including a plate capable of swinging motion in a horizontal plane and a suction sheet engaging member mounted upon the free end of said plate for vertical sliding movement in relation thereto.

4. Separating and feeding apparatus including a plate capable of swinging motion in a horizontal plane, a suction sheet engaging member mounted upon the free end of said plate for vertical sliding movement in relation thereto, and means to exhaust air from said suction sheet engaging member.

5. Separating and feeding apparatus including a plate capable of swinging motion in a horizontal plane, and a sheet engaging member mounted upon the free end of said plate for vertical sliding movement in relation thereto, said sheet engaging member comprising a cylindrical member whose upper end is provided with a wall formed with an opening, and means for exhausting air from said cylindrical member through said opening when the lower end of said sheet engaging member is brought into contact with a sheet of material.

6. Separating and feeding apparatus including a carrier plate capable of swinging motion in a horizontal plane and a sheet engaging member mounted upon the free end of said plate for slight vertical movement relative thereto, and a suction engaging member which is adapted to have a separately operated sliding action in relation to the carrier which supports the sheet engaging member.

7. Separating and feeding apparatus including a plate capable of swinging motion in a horizontal plane, said plate being formed with a slot, a locking lever provided with a pin in one of its extremities, said pin being adapted to project through said slot and to bear against the side walls thereof, and a sheet engaging member mounted upon the free end of the plate, said sheet engaging member being connected to a source of vacuum.

8. Separating and feeding apparatus including a carrier comprising a mechanical motion and a sheet engaging member secured thereto, the said mechanical motion being adapted to impart a slow projecting and a quickly retracting stroke to said sheet engaging member, a suction engaging member which is adapted to have a separately operated sliding action in relation to the carrier which supports the suction engaging member, and means to raise and lower said separating and feeding apparatus.

9. Separating and feeding apparatus including a carrier in communication with a source of vacuum and adapted to separate, pick up a sheet of material and convey it a certain distance and to then release said sheet, and means adapted to engage said sheet to convey it farther, said means comprising a plate capable of oscillating motion in a horizontal plane, a sheet engaging member mounted upon the free end of said plate, and a suction engaging member which is adapted to have a sliding movement in relation to the said carrier, and means to raise and lower said separating and feeding apparatus.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

DAVID DAVIES.

Witnesses:
JOHN THOMAS,
WILLIAM PALMER.