May 24, 1932. A. E. BROADSTON 1,860,132

CLEANING AND DRYING MACHINE

Filed Nov. 18, 1929 6 Sheets-Sheet 1

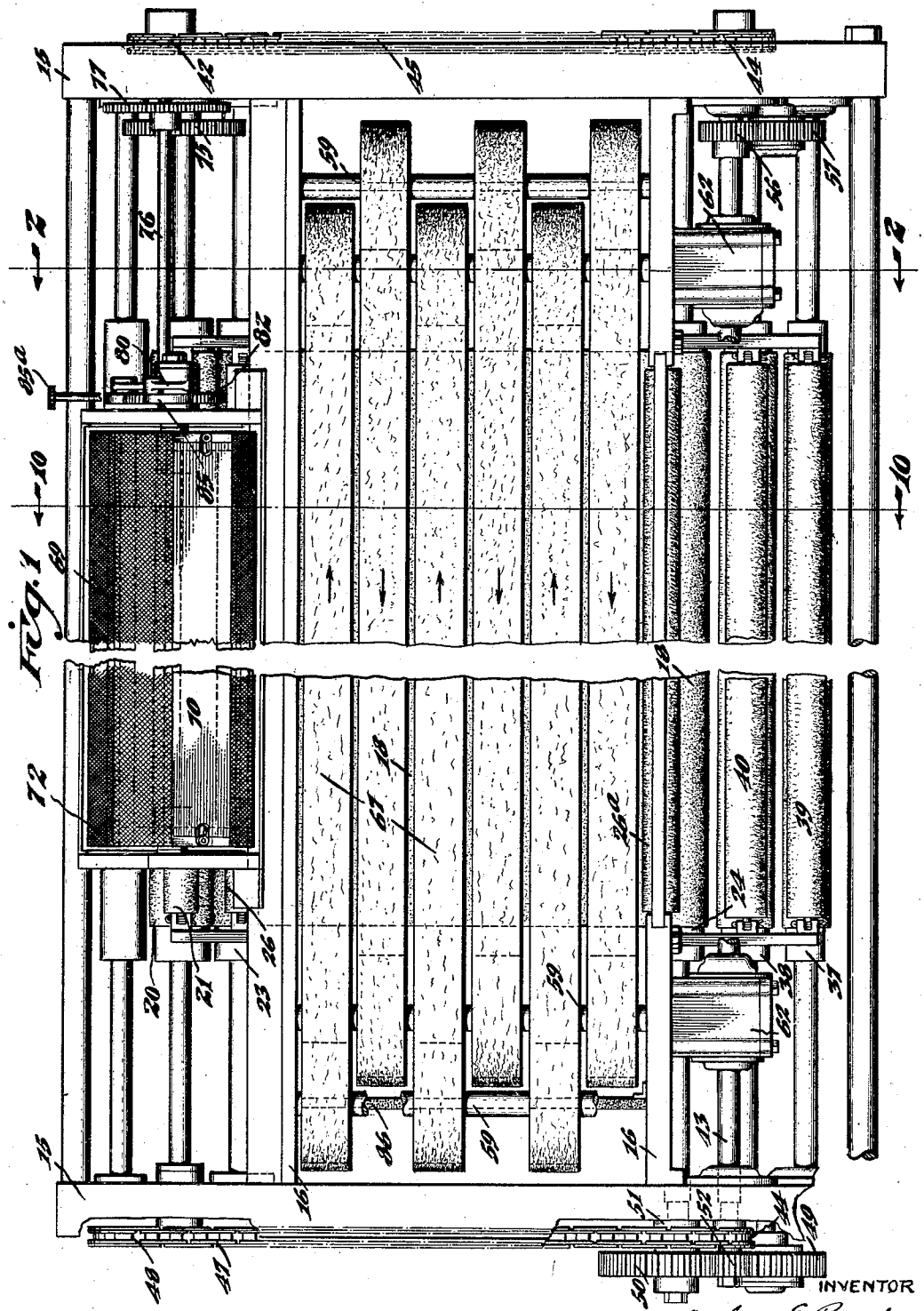

Fig. 1

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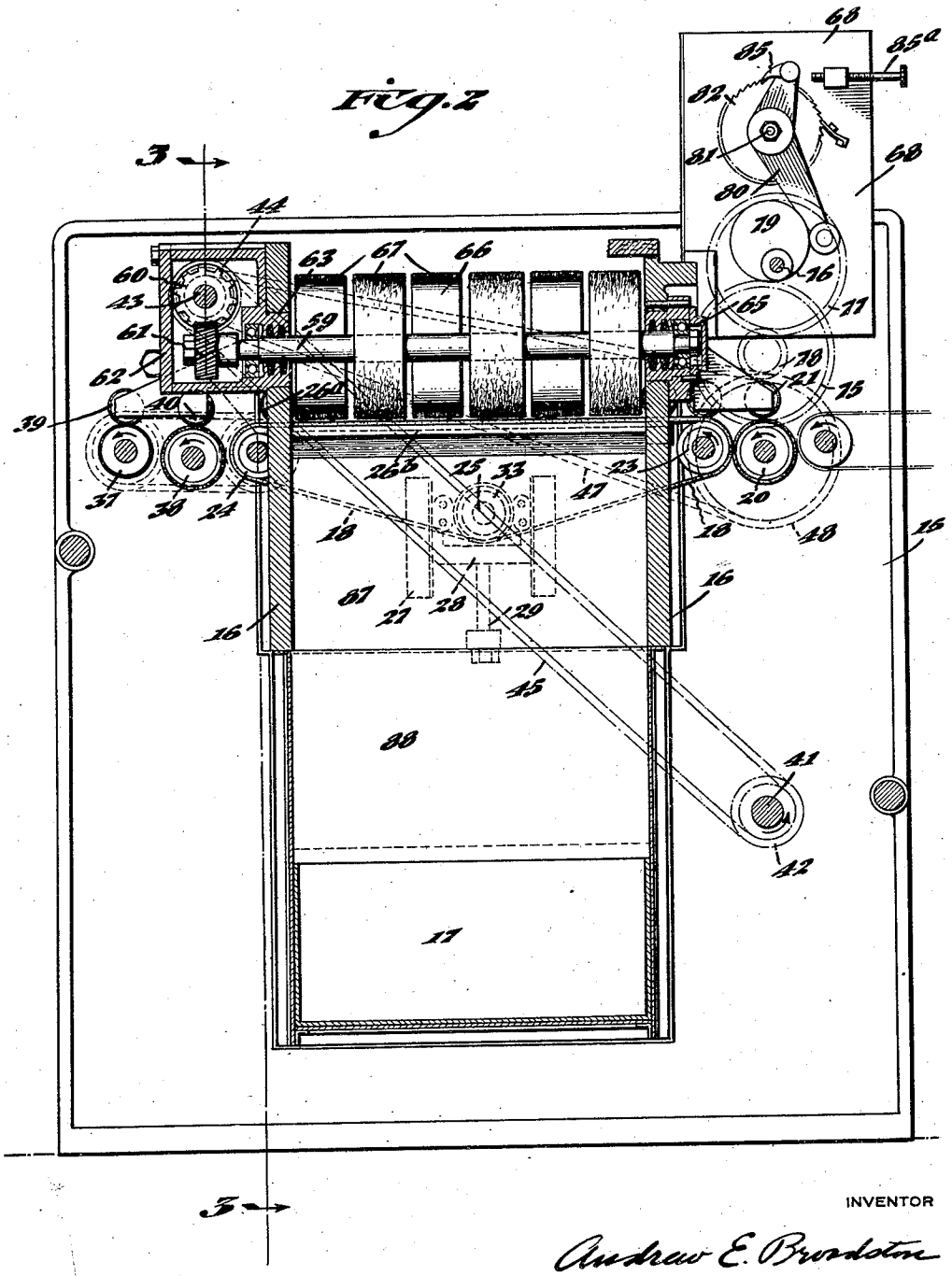
Fig. 2



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CLEANING AND DRYING MACHINE

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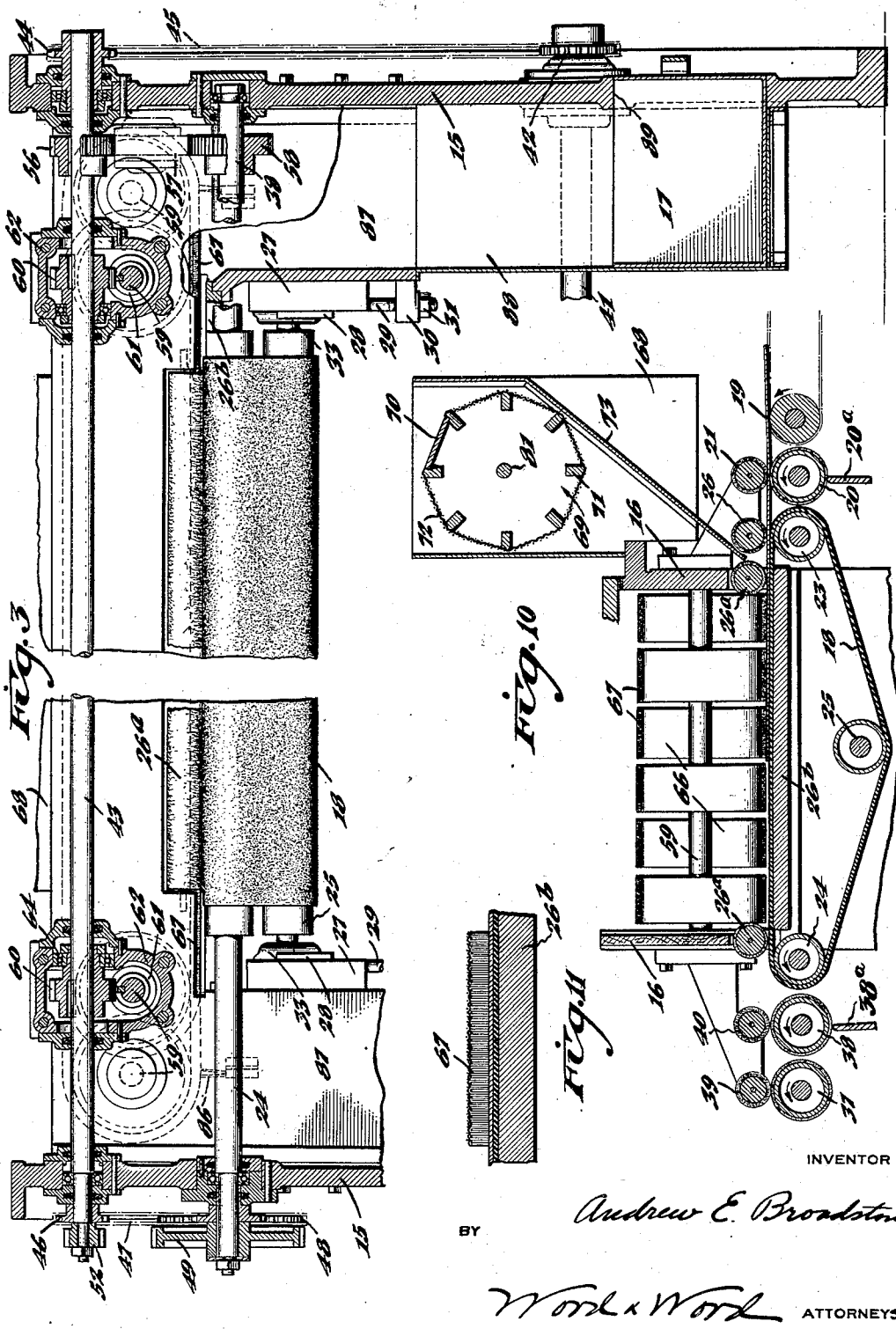

Fig. 3

Fig. 10

Fig. 11

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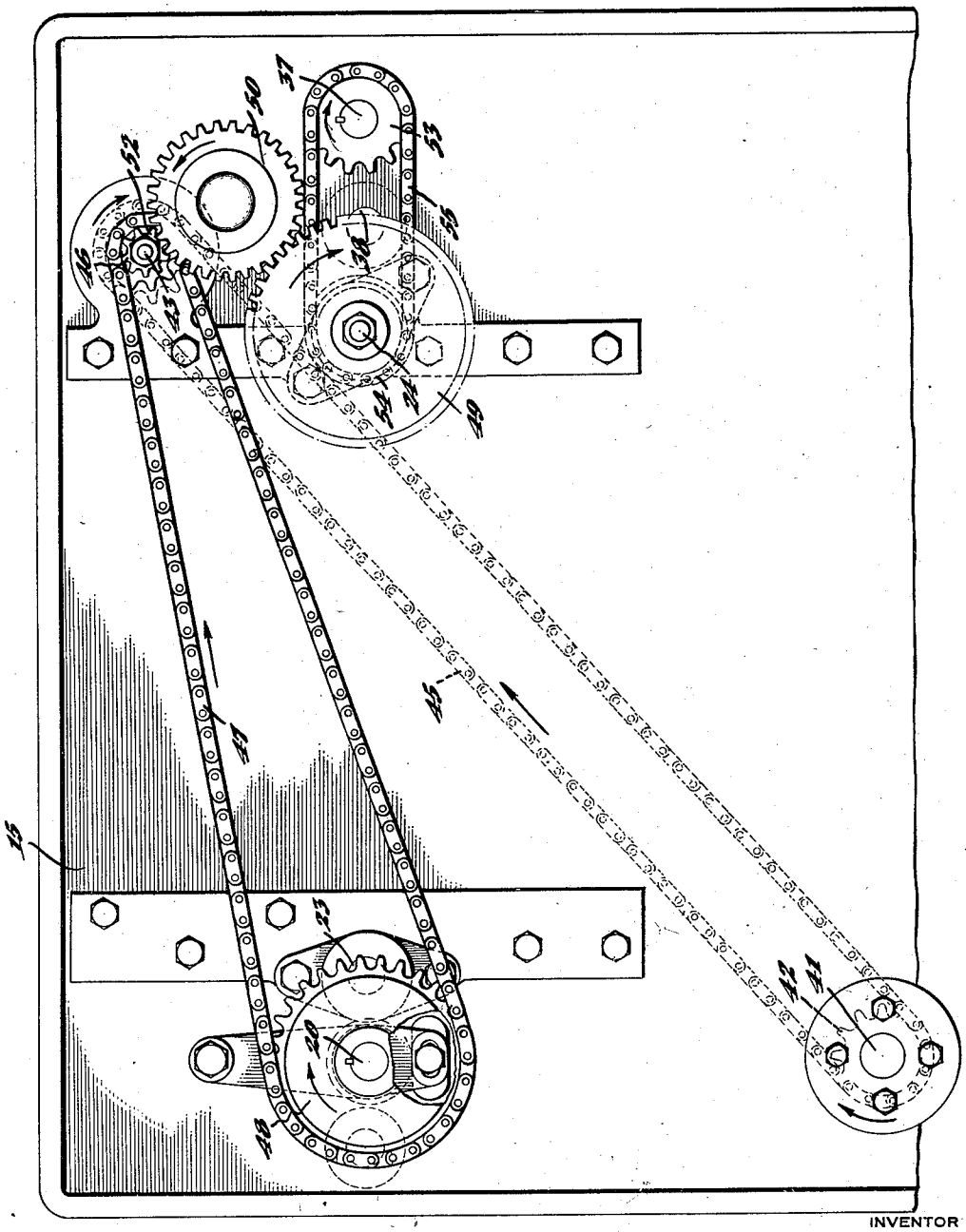

Fig. 4

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CLEANING AND DRYING MACHINE

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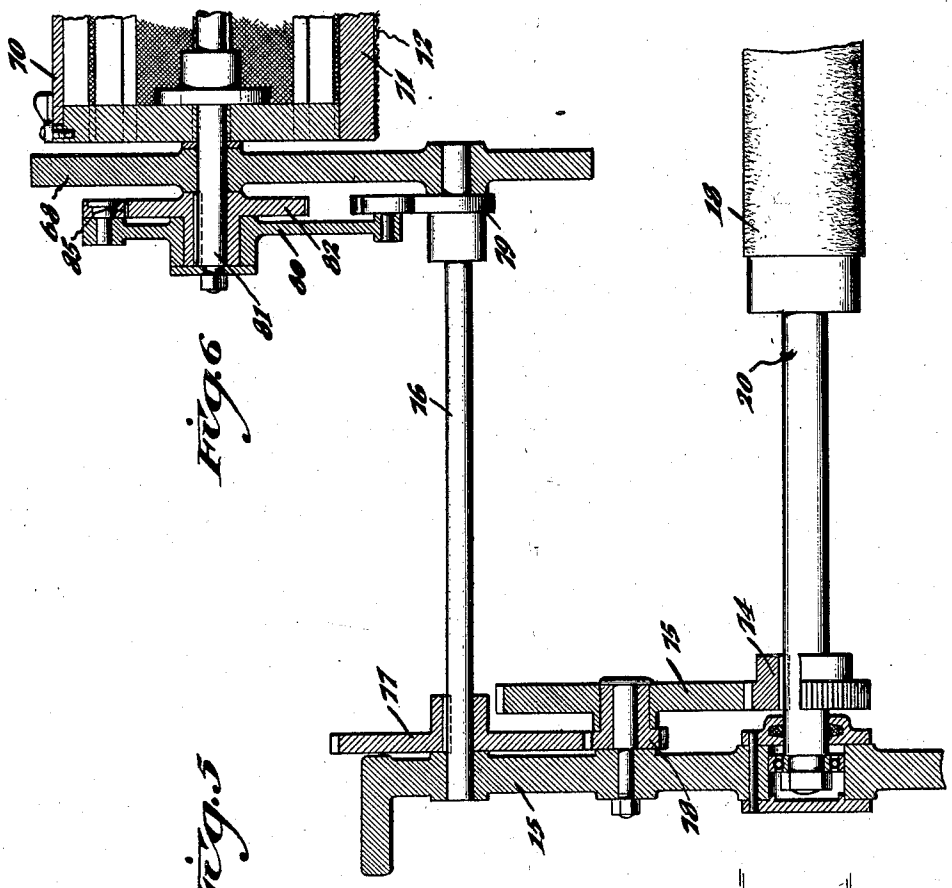

Fig. 6

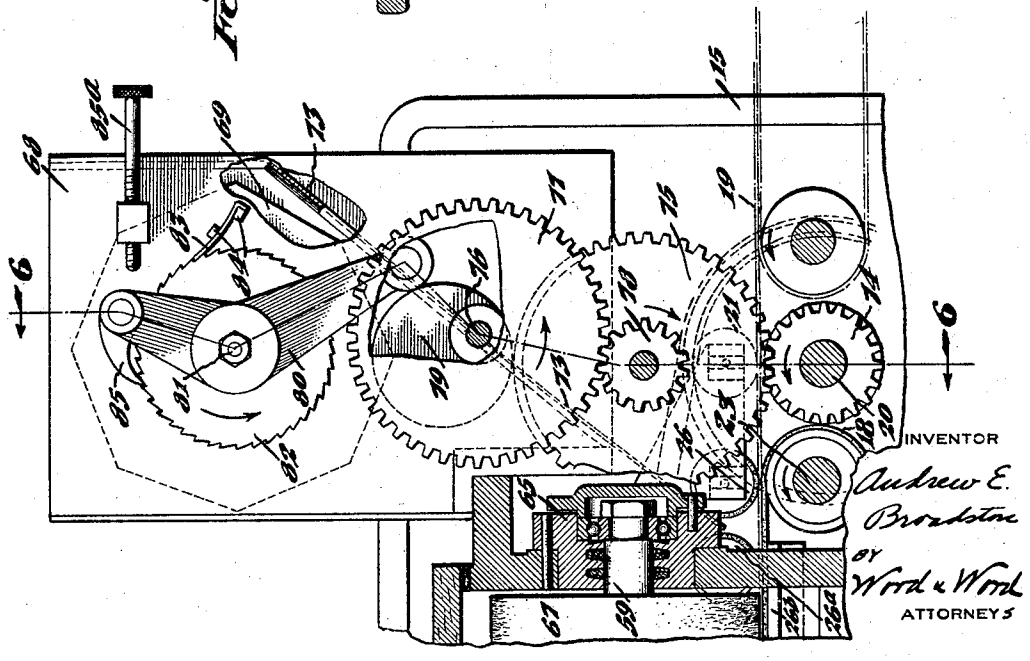

Fig. 5

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CLEANING AND DRYING MACHINE

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Fig. 8

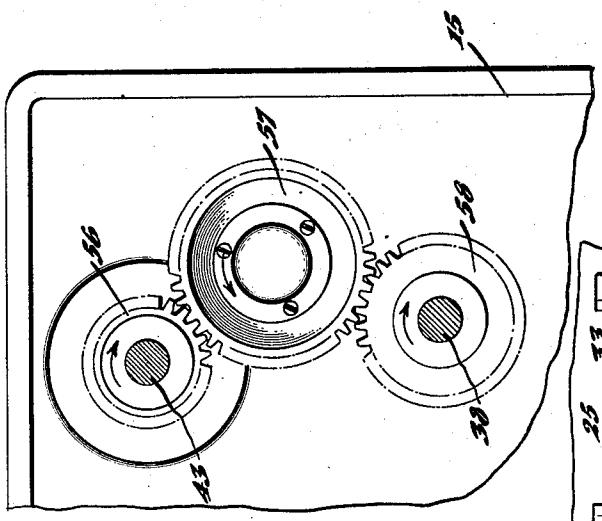


Fig. 9

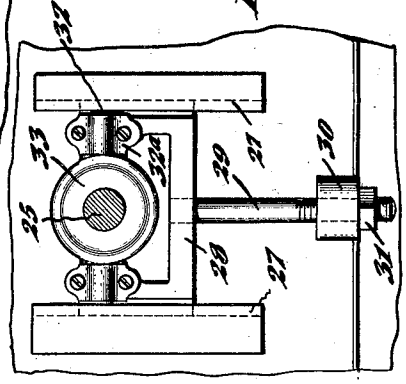
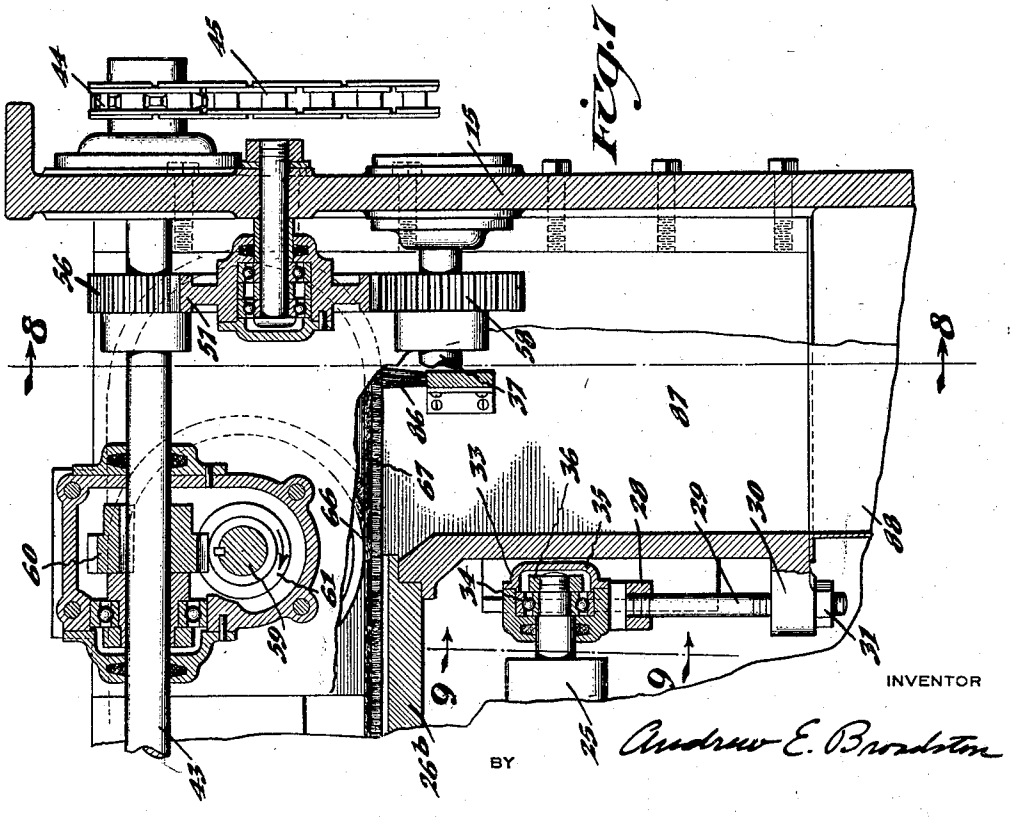


Fig. 7



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Patented May 24, 1932 1,860,132

UNITED STATES PATENT OFFICE

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CLEANING AND DRYING MACHINE

Application filed November 18, 1929. Serial No. 407,887.

This invention relates to a machine for removing excess metal dust from printed or lithographed surfaces. While the machine and method of this invention may be adapted for many specific uses, the invention will be explained in relation to removing the excess metal dust from lithographed surfaces such as those of playing cards.

These cards are usually printed on large sheets in a multiple of the individual unit and later cut. Metal dust is applied when desired by lithographing an adhesive over the portion of the sheet to be bronzed, silvered or gilded, then applying the metal dust to the whole sheet. The metal dust in the main adheres to the portion coated with adhesive but particles remain over the entire surface.

In the past it has been necessary to stack the sheets as they come from the press which applied the metal dust, with extra sheets between the lithographed sheets to prevent setting-off and then after the sheets were dry to run them through a second machine which would polish off the excess metal dust. This required considerable time and manual work as will be obvious from a consideration of the conditions outlined.

Now the machine of this invention, while suitable for dusting the dry sheets, is likewise suitable for removing the excess metal dust while wet as the sheets come from the press on which the metal dust was applied. It is therefore to be observed that the primary object of this invention is to provide a method and machine for removing the excess metal dust from printed and lithographed surfaces and particularly from freshly lithographed or printed surfaces.

Other objects and certain advantages will be more fully set forth in a description of the accompanying drawings, forming a part of this specification, in which:

Figure 1 is a plan view of the machine.

Figure 2 is a sectional view taken on line 2—2, Figure 1.

Figure 3 is a longitudinal sectional view taken on line 3—3, Figure 2.

Figure 4 is a view of the left side of the machine, this view illustrating the driving connections to the various shafts.

Figure 5 is an enlarged view, fragmentary of Figure 2, but of enlarged dimension, illustrating the gearing and the cam and lever arrangement, which periodically rotates the drum or sieve.

Figure 6 is a sectional view taken on line 6—6, Figure 5.

Figure 7 is an enlarged view, fragmentary of Figure 3, and partly broken away to illustrate various details.

Figure 8 is a sectional view taken on line 8—8, Figure 7.

Figure 9 is a sectional view taken on line 9—9, Figure 7, illustrating the lower adjustable blanket roll bearing.

Figure 10 is a sectional view taken on line 10—10, Figure 1 showing the relative positions of all the parts.

Figure 11 is a greatly enlarged view of one of the cleaner belts in cross section, showing it operating upon a sheet of card board.

The machine of this invention comprises three major subcombinations. The first is the dusting or brushing unit; the second is the conveying or feeding mechanism for presenting the lithographed surfaces to the brushing unit; the third is a mechanism for dispensing a drying powder evenly over the lithographed surface prior to its presentation to the brushing unit.

The brushing unit comprises a series of cleaner belts the outer surfaces of which are of a fabric having a soft pile. Adjacent belts travel in opposite directions. At the end of the belts a brush is provided for removing the dust therefrom. Beneath the belts of the brushing unit is an endless conveyor which belongs to the feeding group. The conveyor travels at right angles or transversely to the belts of the brushing unit. This endless conveyor is suitably provided with power driven rollers and appropriate complementary idling rolls for feeding the sheets to the endless conveyor beneath the brushing unit and removing the sheets therefrom. Immediately above the initial feeding rollers is located a container for talc, a dust of magnesia and French chalk, or some other appropriate drying or polishing powder. This container is agitated preferably

periodically to discharge the powder on the lithographed sheet before its presentation to the brushing unit.

The entire machine is driven by an electric motor. Motion reducing mechanism is used in order to give the belts of the brushing unit a relatively rapid motion compared to that of the sheet feeding mechanism.

In detail the machine comprises heavy side frames 15, 15 in which are located the bearings for the parallel roller shafts of the sheet feeding mechanism as well as various power shafts. Secondary frames 16, 16 are provided extending between the heavy journal frames 15, 15. In these latter frames 16, 16 are mounted the bearings for the parallel shafts of the brushing unit. Below the frames 16, 16 is a box, 17, disposed so that the powder and metal dust removed from the sheets may fall into it and be conveniently removed from the machine as desired.

At the right hand side of Figure 2 is disclosed (in dot and dash lines) the endless conveyor 18 by which the sheets 19 are removed from the machine which applied the metal dust to them.

Rubbing this endless conveyor and rotated reversely thereto is a feed-in roller 20 having above it a complementary idling roller 21. The roller 20 is covered with mohair and functions to brush the chalk and gold dust from the conveyor belt 18. The dust is removed from the roller 20 by means of a scraper 20^a disposed longitudinally thereof and below. Adjacent to this feed-in roller is disposed the endless conveyor 18 which presents the sheets 19 to the brushing unit. This belt or conveyor is engaged by three rollers 23, 24, 25, on the feed-in side of the brushing unit, roller 24 on the take-out side of the brushing unit, and a tension roller 25 below the center of the brushing unit. The endless conveyor 18 passes around these three rollers. An idler roller 26 is provided above the endless conveyor over the first mentioned roller of the endless conveyor system.

The lower third roller is adjustably mounted to provide the desired tension for the endless conveyor and to properly align the conveyor on its rollers. Idler rollers 26^a are provided at the intake and discharge end of the conveyor belt, these rollers mounted in the cross frame walls above and at each end of a table 26^b over which the conveyor 22 moves during carriage of the sheet through the brushes. As disclosed (see Figures 7 and 9), slideways 27 are formed on the inner frame in which a bearing frame 28 for the roller is slidably disposed. There are two of these slidable bearings blocks, one at each end of the roller. From each bearing block a threaded rod 29 extends downwardly through a boss 30 extending outwardly from the frame work. A nut 31 is provided on the lower end of each threaded rod for the purpose of adjusting the bearing on the slideways to apply the appropriate tension to the endless conveyor.

The bearing frame or cradle 28, in each instance, is of U-form and a pair of half bearing seats are formed in the face thereof, one in each arm, these seats journalling the trunnions 32 extending from diametrically opposite sides of a swinging bearing box 33. Bearing halves 32^a are secured over the trunnions. This bearing box contains a ball bearing 34 in which the respective end of the roller 25 is secured. A cap 35 is secured to the inner side of a box 33 for accessibility to the nut 36 securing the roller in position. The ends of the roller are therefore journalled in swinging bearings which float relative to the bearing frames, so that in the event of disalignment of the bearing boxes by uneven vertical adjustment for proper conveyor alignment the roller is not bound in its bearings. Adjacent to the take-out end of the endless conveyor two rollers 37, 38, and complementary idling rollers 39, 40, are provided.

The sheet conveying rollers are driven as follows: A power shaft 41 is mounted in the lower portion of the outer frame parallel to the conveying rollers. On the outer end of the power shaft is a sprocket wheel 42. Over the take-out rollers is journalled a countershaft 43, having a sprocket wheel 44 on one end. The countershaft 43 is connected to the power shaft by a chain 45 passing over the sprocket wheels 42, 44, on the ends of the respective shafts. The countershaft is utilized to apply power to the brushing unit. A sprocket wheel 46 at the end of this countershaft, opposite to the one connected to the power shaft, is connected by a chain 47 to a sprocket gear 48 on a trunnion of the feed-in roller 20. The diameters of the sprocket wheels are so chosen as to rotate the feed-in roller at the desired speed. As disclosed, the motion is somewhat reduced.

The endless conveyor 18 for presenting the sheets to the brushing unit is driven by the roller 24 at its take-out end. On the outer end of the roller shaft 24 is located a gear wheel 49 which is driven by a second gear 50 slightly smaller in diameter, said gear being mounted in a side member 51 of the outer frame, and this gear 50 driven by a still smaller gear 52 on the end of the countershaft just on the outside of the pinion which is connected to the feed-in roller. Through the gear arrangement shown, the endless conveyor is driven at the same speed as the feed-in roller.

As noted before there are two take-out rollers 37, 38. The outer one 37 of these is driven from the roller 24 which drives the endless conveyor, the mechanism disclosed comprising a sprocket wheel 53 on the take-out roller 38, a sprocket wheel 54 on the roller of

the endless conveyor just inside of the gear wheel 49 and a chain 55 passing around said sprocket wheels. This mechanism is best illustrated in Figure 4.

The other cleaning or wiping roller 38 is mohair covered and is driven from a countershaft which is provided with a gear 56 mounted just on the inside of the side frame. A second and larger gear 57 is mounted below it in the side frame, and a third gear wheel 58 is mounted below the second gear wheel on the shaft of the take-out roller 37. Through this gearing the roller 38 is driven at a considerably greater rate of speed than the conveyor driving roller and for this reason wipes or cleans the underside of the sheet as it passes through. A scraper blade 38ª is disposed longitudinally beneath the roller and removes the dust therefrom.

Brushing unit

The brushing unit comprises four parallel shafts 59 lying in the same horizontal plane, said shafts disposed at each side of and above the endless conveyor and at right angles to the feed-in rollers. The inner two of these shafts are driven by means of spiral gears 60 mounted on the countershaft above and at right angles to spiral gears 61 mounted on the ends of the shafts of the brushing unit. These gears 60, 61, are protected from dust and dirt by cases 62. These cases 62, Figures 2 and 7, are secured to the frame and have bosses 63 extending into the frame, these bosses axially traversed by the shafts 5, and carrying packing and ball bearings for the shafts surrounding the same. The gears 60 are keyed to the countershaft and are journalled in ball bearings 64 mounted in the cases 62. Ball bearing and packing journal boxes 65 are provided at those ends of the shafts 59 which do not carry gears, these boxes being suitably secured to the frame. The gears 60, 61, are disposed so as to drive the shafts 59 to which they connect, in opposite directions.

Each shaft of the brushing unit carries a plurality of pulley wheels 65, three as disclosed. Pulley wheels on alternate shafts are located in alignment. This arrangement constitutes the outer two shafts 59, as idler shafts. Belts 67 pass over these pulley wheels so that each inner or driving shaft moves three belts which pass in each instance over a pulley wheel on the outer shaft at the opposite end of the unit. These belts are preferably composed of a fabric having a soft pile or nap (see Figure 11) adapted to brush the excess metal dust from the lithographed surfaces without marring the surfaces. The centers of these belts are just above the endless conveyor so that the slack of the belts causes them when in motion to brush the lithographed surfaces disposed on the endless conveyor.

Powder dispensing unit

This unit comprises a box 68 in which is rotatably mounted a receptable 69 adapted to contain the drying powder, said receptacle having a lid or door 70 through which the powder may be introduced. The receptacle is preferably composed of a spider or framework 71 and screening 72 partially or in whole, or some other porous material surrounding the framework. The axis of the receptacle is disposed parallel to the conveyor shafts. Below this receptacle is a chute 73 which slants downwardly and forwardly toward the brushing unit to discharge the powder above the feed inside of the endless conveyor.

The driving mechanism is best disclosed in Figures 5 and 6. Said mechanism comprises a gear 74 on the end of the feed-in roller opposite the end on which its driving sprocket wheel is mounted. Secured to the inner side of the outer frame above this gear are two gears, the larger gear 75 of which is in mesh with the gear 74 on the feed-in roller. Above this double gear is a shaft 76 one end of which is journalled in the main frame, and the other end of which is journalled in the box 68 about the powder containing receptacle. On this shaft is a gear 77 which is in mesh with the small gear 78 of the two gears on the feed-in roller so that this upper shaft turns but once to many revolutions of the feed-in roller.

On the other end of this upper shaft adjacent to the box a cam 79 is secured which actuates a lever 80 pivoted on the shaft 81 of the powder containing receptacle. On the same shaft 81 and keyed to it is a ratchet wheel 82 which is prevented from turning backwardly by a pawl 83 formed of a spring plate having its mounted end secured between a pair of lugs 84 on the side of the box. On the upper end of the lever 80 adapted to be actuated by the cam, a pawl 85 is pivoted and adapted to operate the ratchet so that the cam actuates the lever and the lever operates the ratchet wheel which is on the same shaft as the receptacle. The lever 80 is loosely pivoted on the hub of the ratchet wheel.

A set screw 85ª is adjustably mounted on the end of the box 68 for engaging the arm and limiting the movement of the pawl 85 as the lever 80 swings due to gravity when unsupported by the cam. Thus the receptacle is slowly and periodically rotated and agitated to shake out the drying-out powder and cause it to drop by gravity down the chute and onto the lithographed surface which is supported at the time on the endless conveyor.

It is to be particularly noted that the bearings used throughout the entire device, with

the exception of the bearings for the shaft incidental to the operation of the receptacle, are mounted in ball bearings. The journal boxes contain a ball bearing raceway, a packing adapted to store lubricant and a closure member adapted to keep the dust out. It is to be understood that considerable dust is created by the operation of this machine and that the protection of the bearings from dust is of considerable importance.

As disclosed in Figure 10, the sheet to be dusted comes in over the endless conveyor leading from the press. It is driven through the feed-in roller onto the endless conveyor which presents it as before described to the brushing unit. It is removed from the endless conveyor by the two take-out rollers at the other side of the endless conveyor. As it passes toward the brushing unit, the drying is scattered upon it by the movement of the receptacle containing the drying powder. Beneath each set of idler pulleys of the brushing unit and parallel to the shaft thereof are located bristle brushes 86 which contact the pile of the belt. The belts are so rotated that any particular portion of the belt travels from the sheet being brushed to this belt brush which removes the dust from the belt and prepares it to take up more dust.

The frame of the machine is formed to provide sealed chambers 87 below the respective bristle brushes 86, these chambers having downward continuations in the form of sheet metal bins 88 secured to the frame. The drawers or boxes 17 are supported on the bottoms of the respective bins and are disposed laterally thereinto through openings 89 in the sides of the frame. The used powder is deposited down through the chambers and bins into the drawers and removed, via the drawers.

It is to be observed that this system is adapted for brushing either dried, printed, or lithographed surfaces or freshly lithographed surfaces in which case multiple handling of sheets is obviated.

The chalk deposited periodically on the surface of the printed sheet coming through the machine, acts as a carrier for the excess of loose metal dust. It will be understood that the dust coating on the sheet coming through is still in a moist condition being spread on adhesive applied a short time before. The necessary amount of the dust adheres to the adhesive coated portions of the sheet but considerable excess is spread loosely over the sheet.

The chalk tends to render the dust coating on the adhesive more viscous or sticky, but at the same time acts to mingle with any loose particles scattered about the surface of the sheet. The still moist sheet enters the region below the brushing unit and is subjected to the action of the brushing belts. As mentioned before the driving tension is in the upper lengths of the belts and the direction of movement of the belts is alternately reversed. The belts used have a very heavy pile and the slack lengths of belting engage the sheet lightly and always at the same pressure which is never under any undue force.

The belts are comparatively narrow and move at great speed as compared with the motion of the sheet through the brushing region. Any smearing tendency of one belt is immediately counteracted by the next adjacent belt moving in the reverse direction. Furthermore the provision of narrow belts moving in reverse directions prevents the sheet from being displaced laterally on the conveyor and stabilizes its movement.

The bristle brushes upon the respective ends of the brushing unit remove any dust, chalk, or foreign matter from each belt before it proceeds across the surface of the paper. This constant cleaning prevents any accumulation of dust, ink, or foreign matter on the pile of the belts.

The machine is highly efficient in its work and although the sheets, taken therefrom and stacked, are still in condition which would permit of smearing if a heavy pressure and wiping action were exerted thereon, the machine has thoroughly cleansed the surface without harming the dust coated surfaces.

Having described my invention, I claim:

1. A machine for removing metal dust from lithographed surfaces comprising, two shafts, a plurality of pulley wheels mounted on each of said shafs, a series of belts mounted on said pulley wheels, a second pair of shafts in the same horizontal plane as the first set of shafts having bearings in substantially the same vertical plane as the first set of shafts, a plurality of pulleys on each of said shafts of said second set, a plurality of belts mounted on said pulleys, the pulleys of said first set and said second set alternating, a power shaft running at right angles to said shafts on which the pulleys are mounted, connection between said power shaft and two of said pulley shafts to move said sets of belts in opposite directions, and means for conveying the lithographed surfaces beneath said belts at a level to be lightly brushed thereby.

2. A machine for removing metal dust from lithographed surfaces comprising, two shafts, a plurality of pulley wheels mounted on each of said shaft, a series of belts mounted on said pulley wheels, a second pair of shafts in the same horizontal plane as the first set of shafts having bearings in substantially the same vertical plane as the first set of shafts, a plurality of pulleys on each of said shafts of said second set, a plurality of belts mounted on said pulleys, the pulleys of said first set and said second set alternating, a power shaft running at right angles to said shafts on which the pulleys are mounted, con-

nection between said power shaft and two of said pulley shafts to move said sets of belts in opposite directions, and means for conveying the lithographed surfaces beneath said belts at a level to be lightly brushed thereby, said mechanism driven by said power shaft.

3. A machine for removing metal dust from lithographed surfaces, comprising, two shafts, a plurality of pulley wheels mounted on each of said shafts, a series of belts mounted on said pulley wheels, a second pair of shafts in the same horizontal plane as the first set of shafts having bearings in substantially the same vertical plane as the first set of shafts, a plurality of pulleys on each of said shafts of said second set, a plurality of belts mounted on said pulleys, the pulleys of said first set and said second set alternating, a power shaft running at right angles to said shafts on which the pulleys are mounted, connection between said power shaft and two of said pulley shafts to move said sets of belts in opposite directions, means for conveying the lithographed surfaces beneath said belts at a level to be lightly brushed thereby, said mechanism comprising an endless conveyor immediately beneath the belts, said conveyor driven from one end of said power shaft, a take-out roller adjacent to the end of the conveyor, said roller driven from the other end of said power shaft, a second take-out roller adjacent to the first take-out roller, said second take-out roller driven by the endless conveyor, and a feed-in roller adjacent to the other end of said endless conveyor, said feed-in roller driven from said power shaft by means of a chain.

4. In a machine of the class described, an endless conveyor, means for driving said endless conveyor, a series of belts disposed transversely across the surface of the conveyor, said belts having a heavy nap, and means for driving adjacent belts in reverse directions, said driving motion imparted to the belts in such wise as to exert the driving force on the upper portions thereof whereby the lower portions are slack.

In witness whereof, I hereunto subscribe my name.

ANDREW E. BROADSTON.