A. N. RUSSELL.

PAPER BULKER.

APPLICATION FILED APR. 11, 1914.

1,145,924.

Patented July 13, 1915.

2 SHEETS—SHEET 1.

Fig. 1,

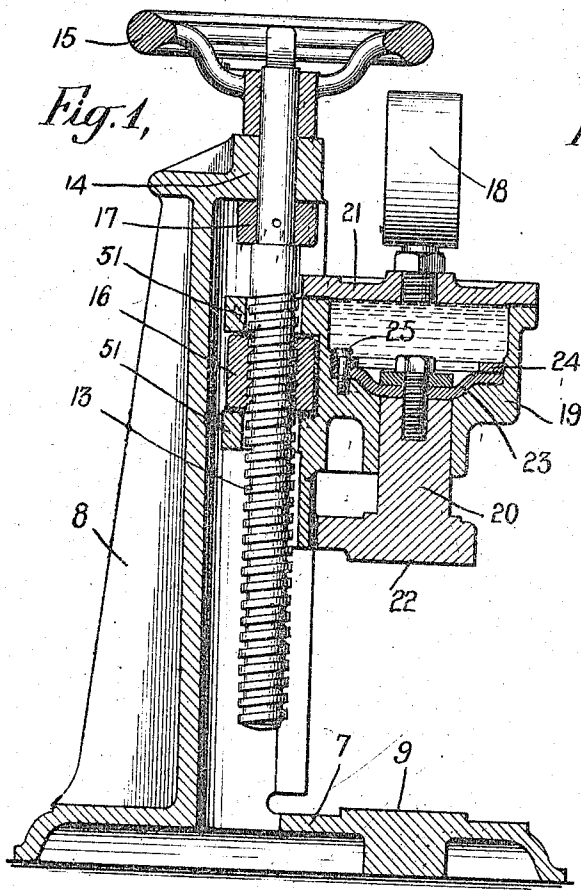


Fig. 2,

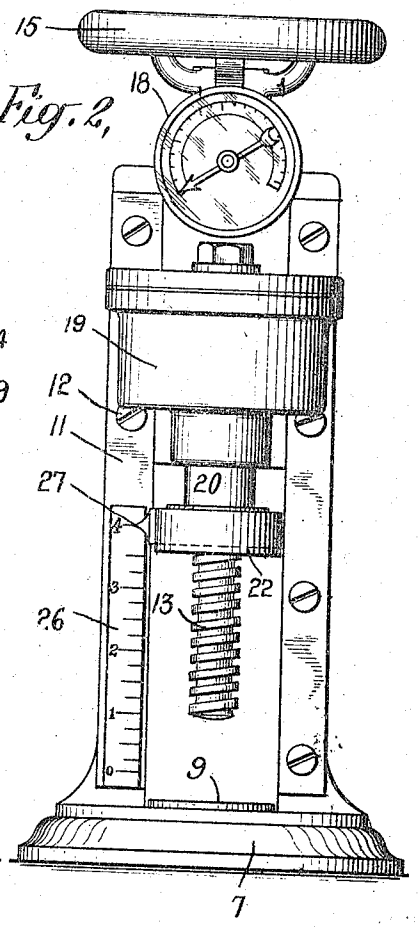
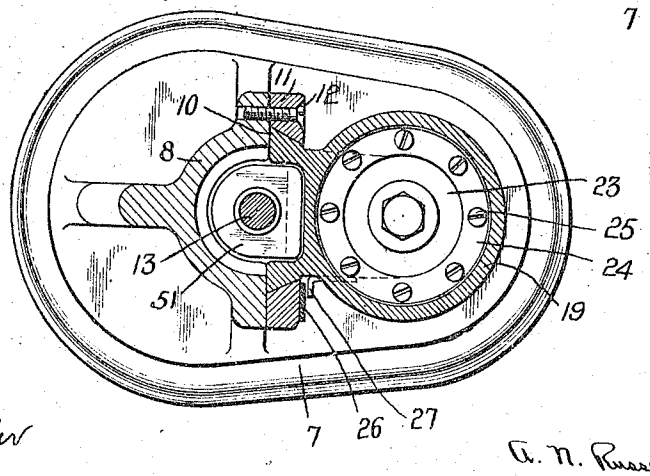


Fig. 3,



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2 SHEETS—SHEET 2.

Fig. 4.

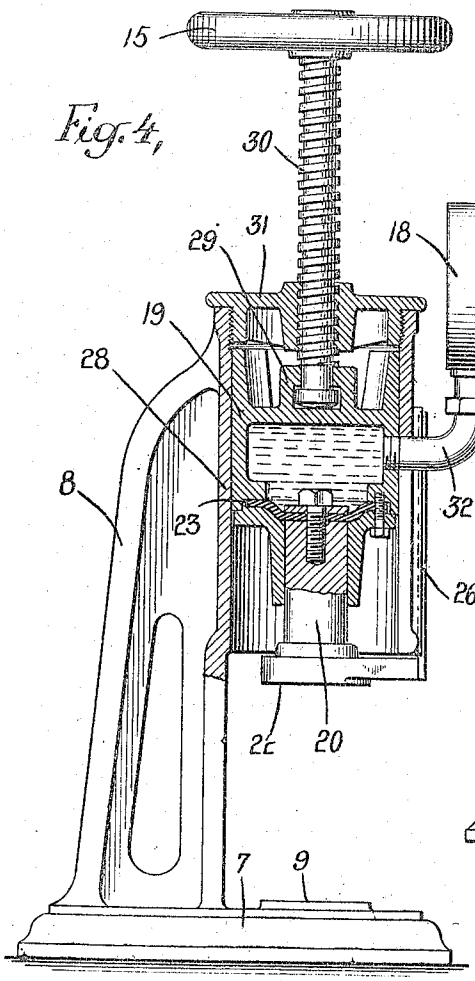


Fig. 5.

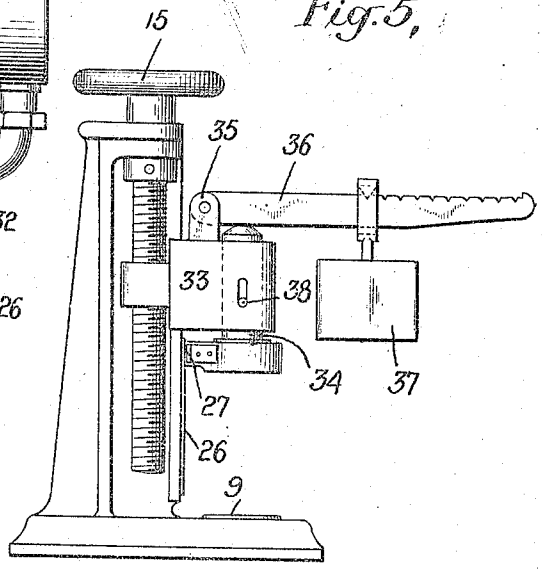


Fig. 6.

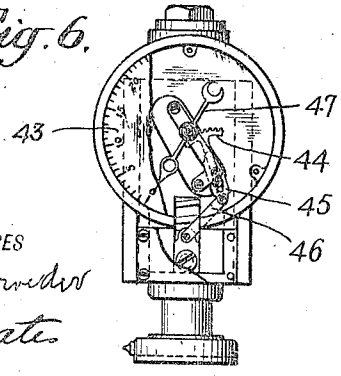
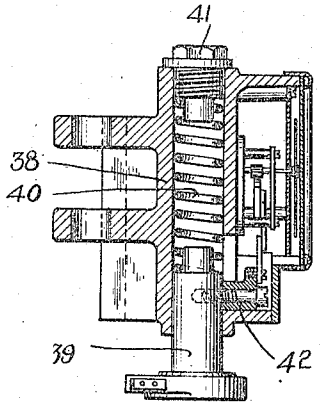


Fig. 7.



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PAPER-BULKER.

1,145,924. Specification of Letters Patent. Patented July 13, 1915.

Application filed April 11, 1914. Serial No. 831,130.

To all whom it may concern:

Be it known that I, ANDREW N. RUSSELL, a subject of Great Britain, residing at Ticonderoga, Essex county, State of New York, have invented certain new and useful Improvements in Paper-Bulkers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention is directed to the provision of an improved apparatus for measuring the thickness of piles of sheets under varying conditions of pressure thereon.

In connection with the manufacture of paper and the uses to which paper is put, it is often necessary or desirable to ascertain the thickness of a pile of sheets when the pile is subjected to a definite pressure. In some instances, it is necessary to manufacture paper of such a thickness that a pile of a definite number of sheets will be of a given thickness under special conditions of use. Also it is sometimes desirable to know what will be the thickness of a definite number of sheets of paper of a particular quality under given conditions of pressure thereon.

The object of this invention is to provide a simple and conveniently operated apparatus whereby the information desired in cases of this character may be obtained.

In accordance with the invention, an apparatus is provided having two opposed plane surfaces of prescribed area arranged to be moved toward and away from each other so that they may be brought into engagement with opposite sides of a pile of sheets and subject the pile to a definite pressure. In combination with these opposed surfaces and the mechanism for moving one or both of them, a pressure gage is provided to indicate with what pressure the opposed surfaces engage the sheet pile. Also, a scale is provided for indicating the distance between the opposed surfaces when the desired pressure is reached as shown by the pressure gage. Preferably one of the two opposed surfaces is the surface of a raised portion on a suitable base of the apparatus and above this and in vertical alinement therewith, a movable member is provided having the second of the two engaging surfaces formed thereon. This movable member consists of two parts which are relatively movable and which move more or less in accordance with the pressure to which the sheet pile is subjected. The pressure gage is mounted upon the movable member and is actuated in accordance with the extent of relative movement of the two parts thereof. With such an apparatus, the pile of sheets to be measured may be positioned upon the engaging surface of the base and then the overlying movable member may be brought down upon it until the engaging surface thereof presses upon the top of the sheet part. This pressure causes relative movement of the two parts of the movable member, co-extensive with the degree of pressure upon the sheet pile and this pressure is indicated by the pressure gage. When the movable member has been caused to press upon the sheet pile with the desired degree of pressure, the distance between the two engaging surfaces is ascertained by reference to the scale associated therewith, so that by reading the indication of this scale, the thickness of the sheet pile when the pile is subjected to the pressure indicated by the gage will be obtained.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a central vertical section of the apparatus; Fig. 2 is a front view of the same; Fig. 3 is a horizontal section through the upper or movable member of the measuring couple; Fig. 4 is a view partly in elevation and partly in vertical section of a modified form of measuring apparatus; Fig. 5 is an elevation of a further modification; Fig. 6 is a detail view illustrating a portion of a further modification, broken away in part; and Fig. 7, is a sectional elevation of the construction shown in Fig. 6.

Referring first to Figs. 1, 2 and 3, the machine consists of a base 7 and an upright frame 8, formed integral therewith. On the base 7 is a raised portion 9 having a horizontal surface of known area, preferably an even number of square inches or square centimeters. The surface of this raised portion 9, forms one of the two surfaces which are adapted to engage opposite sides of the sheet pile to be measured.

The other of the two surfaces is formed upon the lower end of a movable element arranged directly over the raised portion 9,

and movable toward and away from the same. This movable element is provided with flanges 10, which fit into ways on the frame 8, provided by strips 11, which are secured by bolts 12 to the frame 8. The movable element is adapted to slide vertically in the ways and its vertical movement is effected by a screw 13, which is received in a bearing 14 on the frame 8 and provided with a hand-wheel 15 at its upper end by which it may be rotated as desired. On the movable element are projections 51, provided with openings through which the screw 13 extends and a nut 16 is secured to the movable element between these projections 51. The nut 16 has a threaded opening therethrough which receives the screw 13 and which co-acts with the screw in effecting the vertical movement of the movable element. The shaft of the screw 13 is prevented from moving vertically in its bearing 14, by the hub of the hand-wheel 15 and a collar 17, which is secured to the shaft of the screw.

The movable element consists of two relatively movable parts, the relative movement of these parts being effected when subjecting the sheet pile to pressure and the extent of this relative movement being registered upon a pressure gage 18. The two parts of the movable element are shown at 19 and 20. The part 19 is in the form of a cylinder having a chamber in the upper portion thereof which is closed by a disk 21 secured to the upper end of the cylinder 19. The cylinder 19 is provided with an opening leading from the chamber thereof to its lower end, and this opening receives the upper cylindrical portion of the part 20 of the movable member. The lower end of this part 20 has the upper engaging plane surface formed thereon, and horizontally disposed, this surface 22 being, preferably though not necessarily of the same shape and area as the surface of the raised portion 9, and arranged directly over the raised portion 9, as shown in Fig. 1. The upper end of the part 20 of the movable element is secured to a flexible diaphragm 23, located in the bottom of the chamber in the cylinder 19. This diaphragm 23 is circular in form and its peripheral portion is secured to the bottom of the chamber in the cylinder 19 by means of a ring 24 and bolts 25 passing through this ring and the diaphragm and into threaded openings in the body of the cylinder 19.

The disk 21 has a threaded opening therein in which the stem of the pressure gage 18 is received and through which water or other liquid in the chamber in the cylinder 19 may flow to cause actuation of the indicator of the gage.

The distance between the co-acting opposed surfaces 9 and 22 is indicated by a scale plate 26 which is secured in a vertical position to the frame 8 and an index 27 secured to the part 20 of the movable element co-acts with this scale plate 26 to give the necessary indications.

With the apparatus constructed in the manner indicated in Figs. 1. 2 and 3, the pile of sheets to be measured is placed upon the lower surface 9 of known area and then the hand-wheel 15 is turned so as to lower the whole movable element until the engaging surface 22 thereof comes into contact with the upper surface of the sheet pile. On further downward movement of the movable element, the pile of sheets is subjected to pressure, and as this pressure increases, the part 20 of the movable element is forced upwardly into the part 19, flexing the diaphragm 23 and causing some of the liquid in the chamber in the cylinder 19 to flow upwardly into the gage 18. As a result of this, the index of the gage 18 is moved around over its scale so as to indicate the pressure per unit of area of the surface 22 upon the sheet pile. The hand-wheel 15 is turned to lower the movable element in this manner until the gage 18 indicates that the desired pressure upon the sheet pile has been reached. When this has been done, the position of the index 27 with reference to the scale plate 26 is read in order to ascertain the exact distance between the two opposed engaging surfaces 9 and 22.

In Fig. 4, a construction similar in many respects to that shown in the preceding figures is illustrated. The construction shown in Fig. 4 differs from that shown in Fig. 1 primarily in that the screw for effecting the vertical movement of the movable element is arranged above and in axial alinement with the movable element. The frame 8 of the apparatus has a cylinder 28 formed thereon which serves as a guide for the movable element consisting of the cylinder 19 and the plunger or piston 20. The cylinder 19 has a box 29 formed thereon which receives the lower enlarged end of the shaft of the screw 30. This screw is received in a threaded opening in a circular piece 31 which closes the top of the cylinder 28. This cylinder has a vertical slot in the front thereof to permit movement of a tube 32 which connects the chamber within the cylinder 19 with the gage 18. The scale plate 26 is secured to and moves with the plunger 20 of the movable element, an index similar to that shown in Fig. 2 being arranged upon the cylinder 28 to co-act with this scale plate. The operation of this apparatus is substantially the same as that above described in connection with the preceding figures.

In Fig. 5, a somewhat different construction is illustrated. This differs from the forms of the invention shown in the pre-

ceding figures in that the relative movement of the two parts of the movable element is effected by lifting a weight. The moveable element in this instance consists of a frame 33, having a vertical opening therein to receive the end of the plunger 34. On the upper face of the frame 33 are standards 35 in which a beam 36 is pivotally mounted and a weight 37 is adapted to be positioned at any one of a number of points along the length of this beam. The plunger 34 is provided with a pin 38 which moves in a slot in the frame 33. In using apparatus of the type shown in Fig. 5, the movable element is moved downwardly into engagement with the pile of the sheets on the lower engaging surface 9 by turning the hand-wheel 15. This downward movement of the movable element is continued until the part 34 thereof is moved relatively to the part 33, raising the weight 37. When this takes place, the pile of paper will be subjected to a definite pressure, this pressure being determined by the position of the weight 37 lengthwise of the beam 36. A reading of the thickness of the pile of sheets may then be had by reference to the scale 26 and index 27.

A further modification of the invention is illustrated in Fig. 6, wherein the relative movements of the two parts of the movable element are effected against the tension of a spring. The two parts of the movable element are shown at 38 and 39 and a spring 40 is arranged between them so that upward movement of the part 39 relatively to the part 38 causes compression of this spring. The part 38 has a vertically disposed opening of circular cross section therein which receives the upper cylindrical portion of the part 39. The spring 40 is arranged in the opening in the part 38 between the upper end of the part 39 and a removable plug 41 threaded into the upper end of that opening. The plunger 39 has a block 42 secured thereto which moves in a suitable slot provided in the part 38. This block coacts with the wall of the slot to limit the downward movement of the plunger 39 relative to the part 38. The pressure gage 43 is secured to the front of the part 38. It comprises a pivoted index 47 movable over a suitable scale and having a pinion secured to its spindle. This pinion is engaged by the teeth of a segment 44 formed on a pivoted lever 45 and the opposite end of this lever 45 is connected by a link 46 with the block 42. This construction is such that when the engaging surface at the lower end of the plunger 39 is forced against the pile of paper, the plunger is moved relatively to the part 38 against the tension of spring 40 and as it is so moved it operates through the link 46 and lever 45 to move the index 47 over the scale of the gage. The tension of the spring 40 may be adjusted by changing the position of the threaded plug 41.

It will be seen that with all of the several constructions illustrated in the drawings and above described, a pile of sheets may be subjected to pressure between two surfaces of known area arranged directly opposite each other. The extent of this pressure may be regulated as desired and when the desired pressure is reached, the distance between the two opposed surfaces, and hence the thickness of the pile of sheets, may be ascertained by reference to the scale. The mechanism for indicating the pressure with which the pile of sheets is subjected includes a movable element which may be moved as a whole to subject the pile to pressure and which consists of two parts which are moved relatively in accordance with the degree of pressure to which the sheet pile is subjected. This relative movement of the two parts of the movable element is arranged to effect the actuation of the pressure gage.

What I claim is:

1. In an apparatus for measuring paper, the combination of a base presenting a plane surface of prescribed area, a member presenting a plane surface opposed to said first mentioned plane surface, a supporting means for said member permitting movement of the member relatively to the supporting means, means for moving said supporting means and said base relatively toward and away from each other to vary the pressure of said surfaces upon a sheet pile lying between them and thereby causing movement of said member relatively to its supporting means, a pressure gage, means for actuating the gage in accordance with the movement of said member relatively to its supporting means and means for indicating the distance between said surfaces; substantially as described.

2. In an apparatus for measuring paper, the combination of a member having a surface thereon of prescribed area for engagement with one side of a sheet pile, a movable element consisting of two relatively movable parts one of which has an opposed surface thereon for engagement with the opposite side of the sheet pile, means for moving said member and said element toward and away from each other, a pressure gage actuated in accordance with the relative movement of the two parts of said movable element and means for indicating the distance between said surfaces; substantially as described.

3. In an apparatus for measuring paper, the combination of a frame, a movable element mounted thereon and consisting of two relatively movable parts one of which has a surface thereon for engagement with a

sheet pile, a screw for moving said element upon the frame, a pressure gage actuated by the relative movement of the two parts of said element and means for indicating the position of said surface; substantially as described.

4. In an apparatus for measuring paper, the combination of a base presenting a plane surface, a frame, a movable member mounted on the frame and having an opening therein, means for moving said member, a part extending within said opening and movable relatively to said member, said part having a plane surface thereon opposed to said first mentioned plane surface, a spring located in said opening and compressed by the movement of said part relatively to the movable member, a pressure gage actuated in accordance with the relative movement of said part and said movable member and means for indicating the distance between said surfaces; substantially as described.

5. In an apparatus for measuring paper, the combination of a frame, a member movably mounted on the frame and having an opening therein, a part extending within said opening and movable relatively to said member, a spring located in said opening and compressed by the movement of said part, and a pressure gage mounted on said member and connected to said part so as to be actuated by the movements of said part relative to said member; substantially as described.

6. In an apparatus for measuring paper, the combination of a member having a surface thereon of prescribed area for engagement with one side of a sheet pile, a movable element consisting of two relatively movable parts one of which has an opposed surface thereon for engagement with the opposite side of the sheet pile, a pressure gage mounted on and moving with the movable element and actuated by relative movement of the two parts thereof, and means for indicating the distance between said surfaces; substantially as described.

7. In an apparatus for measuring paper, the combination of a frame, a base having a horizontally disposed plane surface of prescribed area thereon, a movable element mounted on the frame, and consisting of a cylinder and a plunger whose upper end projects within the cylinder and whose lower surface is horizontal and directly over said surface, a screw for effecting vertical movement of the movable element, means for indicating the distance between said surfaces, and a pressure device mounted on said cylinder and actuated by relative movement of the cylinder and plunger; substantially as described.

8. In an apparatus for measuring paper, the combination of a frame, a base having a horizontally disposed plane surface of prescribed area thereon, a movable element mounted on the frame and having a horizontal surface of prescribed area directly over said surface, means for moving the movable element vertically upon the frame, a pressure gage mounted upon the movable element and actuated in accordance with the pressure of said surface on the movable element upon a sheet pile placed between the said surfaces and means for indicating the distance between said surfaces; substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses.

ANDREW N. RUSSELL.

Witnesses:
RICHARD F. HAYES,
JOHN T. MOYNIHAN.