

(No Model.)

W. C. EDWARDS.
MAGNETIC PULP SEPARATOR.

No. 446,704.

Patented Feb. 17, 1891.

Fig. 1

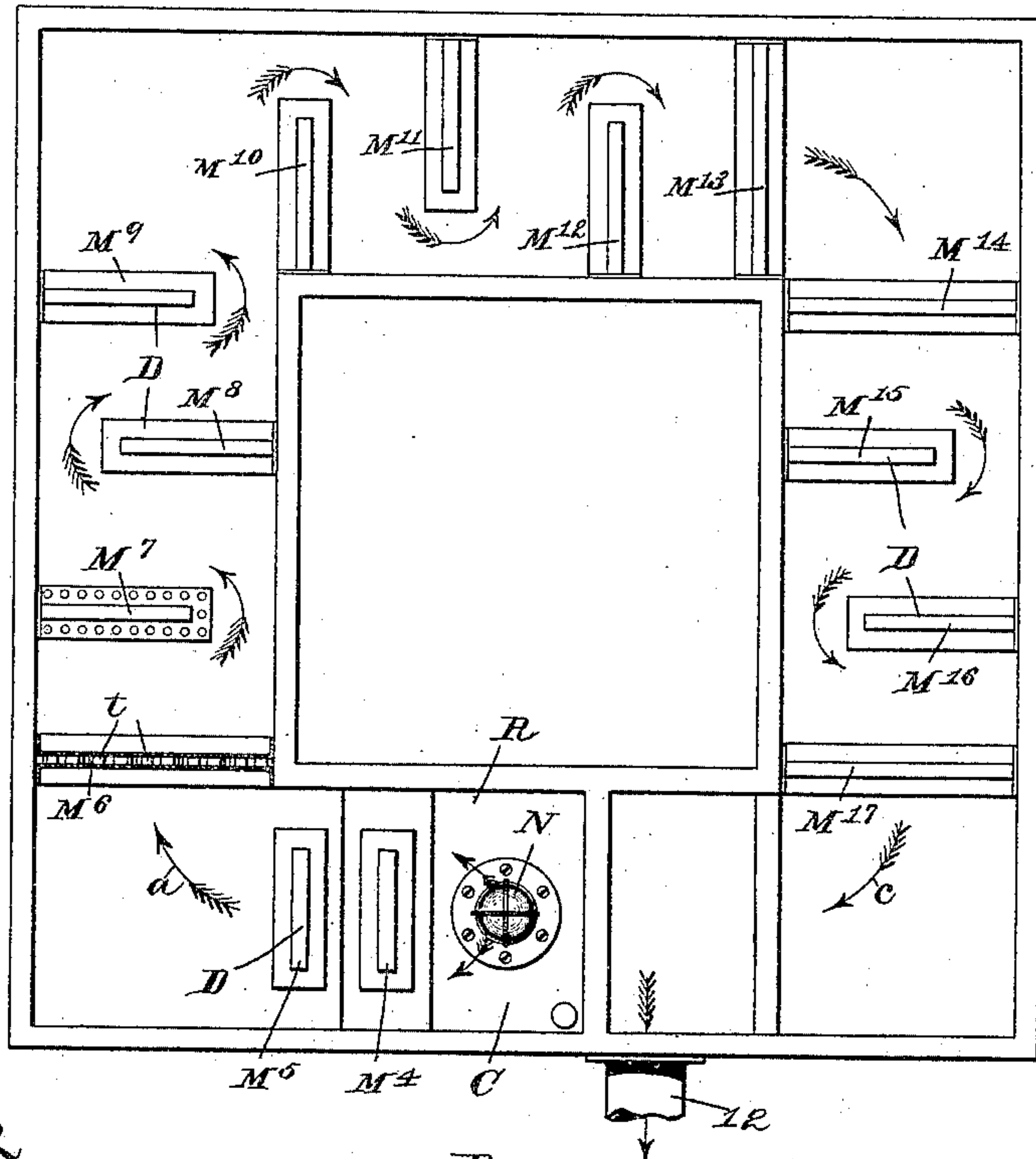
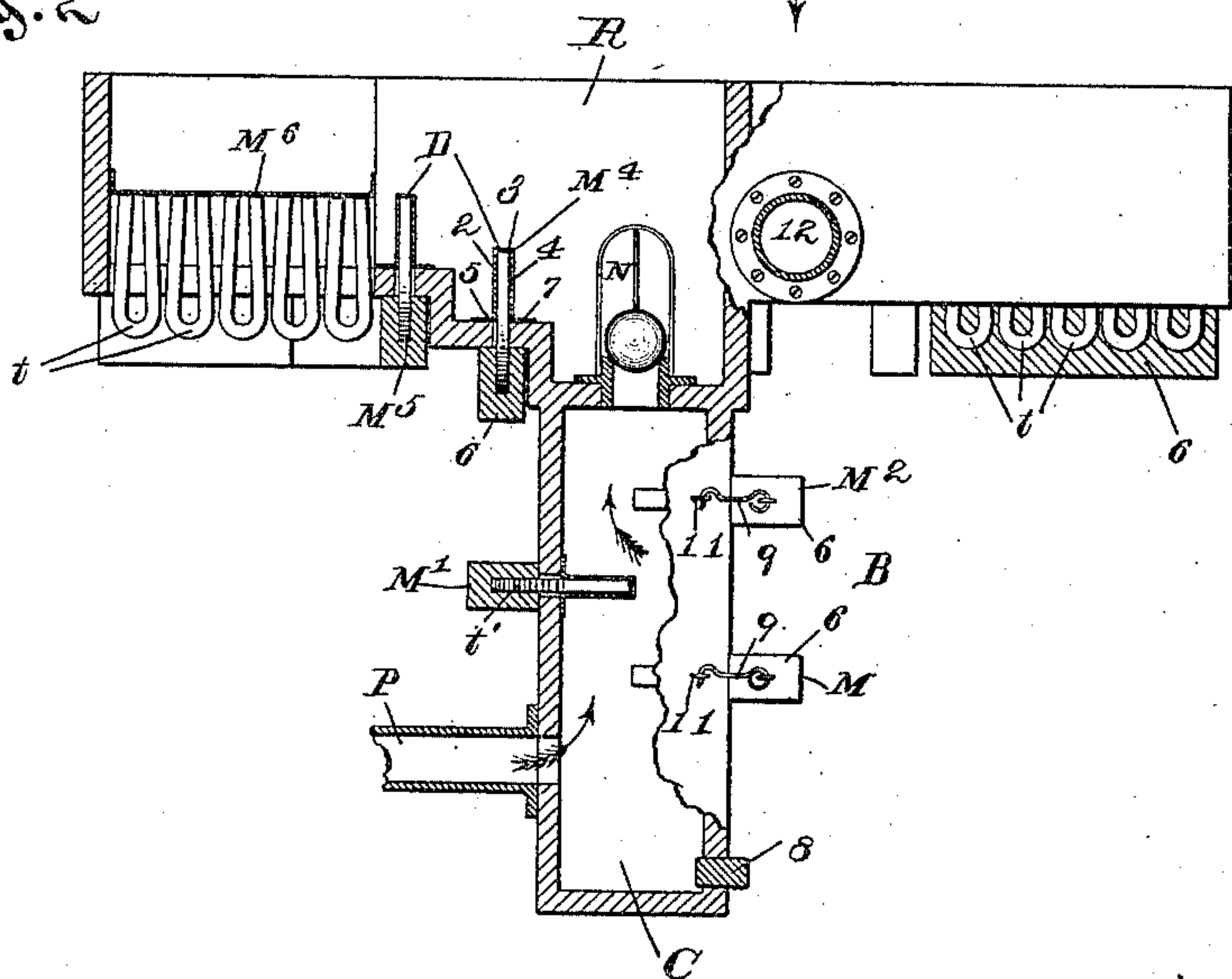


Fig. 2



Witnesses:

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By his Attorney,

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UNITED STATES PATENT OFFICE.

WILLIAM C. EDWARDS, OF HOLYOKE, MASSACHUSETTS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO ROSWELL M. FAIRFIELD, OF SAME PLACE, AND OSCAR S. GREENLEAF, OF SPRINGFIELD, MASSACHUSETTS.

MAGNETIC PULP-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 446,704, dated February 17, 1891.

Application filed September 29, 1890. Serial No. 366,492. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. EDWARDS, a citizen of the United States, residing at Holyoke, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Magnetic Pulp-Separators, of which the following is a specification.

This invention relates to magnetic separators for separating metallic particles from paper-pulp, the object being to furnish an apparatus in which the magnetism may be furnished by ordinary horseshoe-magnets arranged and combined for effective action and protected from contact with the pulp.

In the drawings accompanying and forming a part of this specification, Figure 1 is a plan view of an apparatus embodying my improvements. Fig. 2 is a side elevation of the same, partially in section.

Similar characters designate like parts in all the figures.

The apparatus shown in the drawings consists of a box or trough through which the pulp flows, passing in its course over riffles containing magnets, and also arranged for catching sand and mineral matter after the manner of the ordinary sand-box. The pulp may be delivered to the trough from above, or through an opening in one side thereof; but I prefer delivering through a valve—as, for instance, the inlet-valve N—in the bottom of the trough. One part of my improvements relate to apparatus intermediate to the pump-pipe P and to said inlet-valve. This apparatus consists of a vertical box, which ordinarily should extend below said pump-pipe to form a catch-basin C, which basin may be drained through an opening stopped by an ordinary plug or bung 8. In the opposite sides of said catch-box above the pump-pipe I place several sets of magnets, which are substantially the same as the sets used in the separator proper, and which are usually arranged horizontally, as shown.

The magnets used are or may be of the ordinary horseshoe type, and are designated by *t*, being shown in side view at the left hand in Fig. 2, in top view in Fig. 1, and in edge view at *t'*, Fig. 2.

The magnets are set with their poles standing in a case or hollow riffle, which is designated in a general way by D, and consists of the two side walls 2 and 4 (see Fig. 2) connected at the top by the top plate 3, and having at the base flanges, as 5 and 7, whereby the case is firmly fastened to the floor of the trough by numerous screws or tacks, so as to make a water-tight joint, in a well-known manner. Access to the interior of the magnet-case is had through a slot in the bottom or wall of the trough, as indicated in the drawings. For holding the magnets properly in the riffles D this may be of a size closely fitting thereon, so the magnets will be held by friction; but owing to the unreliability of this method and the practical difficulty of readily securing the proper fit I prefer to fix the lower ends of the magnets in a block or carrier 6, (usually made of wood,) so that one entire set of magnets, together with their carrier, may be handled as though a single part of the apparatus. For holding the blocks in place I provide the ends thereof with suitable fastenings—as, for instance, the hooks 9, Fig. 2—and adjacent to the blocks fix in the apparatus suitable eyes, as 11, for engaging said hooks. By this means the sets of magnets are readily held in place, while by unlocking the fastening thereof any said set may be readily removed. Usually several magnets are used in one riffle, as well shown at M⁶, Fig. 2; but one or more of the magnets may be so used, according to the requirements in any particular instance.

The several sets of magnets, each considered as one element of the apparatus, are designated by M M' M² M⁴, &c. Several sets are placed alternately on opposite sides of the catch-box or settling-box B, as shown in Fig. 2, and designated by M, M', and M². Each set is provided with an inwardly-projecting magnet-case or riffle D. These magnet-cases should extend into said box B sufficiently far, substantially as indicated, so as to cause a serpentine rising movement of the pulp, whereby the magnets are rendered more effective for their purpose. The paper-pulp flowing through the pipe P enters the box B with a considerable velocity and is naturally directed upward, as indicated by the arrow, so that

any mineral matter carried along with the pulp tends by reason of its superior gravity and momentum to be thrown out of the current, and thus allowed to settle in the catch-basin C, afterward to be removed or washed out through the opening stopped by the plug 8.

Immediately over the settling-box B a section R of the separator-trough is formed of extra depth and has successive magnetic riffles, as M^4 and M^5 , set at successive elevations, respectively, for the purpose of acting most effectively on the eddy currents caused by the upflow of pulp into said chamber R of the separator. From said chamber the pulp flows toward the left hand in Fig. 1, as indicated by the arrow a , and next encounters one of the magnetic riffles designated in a general way by M^6 . Flowing over the top of this riffle or cross-bar the pulp next encounters several similar magnetic riffles, which are preferably made of a length slightly less than the width of the trough and set alternately against opposite sides thereof, as indicated in Fig. 1, M^7 to M^{12} , inclusive. These shorter magnetic riffles being arranged alternately, as indicated, gives to the pulp-current a serpentine movement, whereby the pulp is peculiarly intermingled and caused to flow along the sides of the magnet-cases, so that during the passage of the pulp among the series of said cases it is all brought into contact one or more times with the thin walls of the magnet-case, and thus thoroughly acted upon by the magnets. This result is found to be important for the well-known reason that the power of a magnet on any small particle of metal diminishes rapidly as the distance increases. It will be observed that the series of six magnetic riffles M^7 to M^{12} , inclusive, are shown arranged in two sets located at right angles, so that after passing the riffle M^9 the general direction of the current is abruptly changed to a crosswise direction toward the right hand in Fig. 1. This construction of the trough, whereby one part is located crosswise to a preceding part and the arrangement of the intercepting magnet-cases therein abruptly changes the direction of the pulp-current at the junction of said parts, thus materially increasing the efficiency of the magnetic action. In the drawings several other magnetic riffles, as M^{13} to M^{17} , inclusive, are shown, of which M^{13} , M^{14} , and M^{17} are duplicates of the riffle M^6 , and extend entirely across the trough, thus forming riffles over which all of the pulp must necessarily pass. The riffles M^{13} and M^{14} being located crosswise and adjacent to each other, the current flowing from one of them to the other is changed in a manner to promote the thorough intermingling thereof, whereby all the pulp is more surely brought into contact with some one or more of the several magnet-cases. The material for the magnet-cases should be a non-magnetic metal, copper being preferable. Iron is not suitable, for the reason that it

acts as an armature and shuts off or neutralizes the magnetic action to a large extent. My improved magnetic riffle being composed of horseshoe-magnets incased in a thin non-magnetic covering projecting up a considerable distance, substantially as set forth, above the floor of the separator-trough, furnishes a large magnetic area for collecting the metallic particles floating in the pulp, which, by reason of their weight and the agitation of the pulp, naturally slide down the sides of the riffle to the base thereof, so that should the magnets be removed the accumulation of metallic particles remains in the pockets between the riffles, instead of being carried on by the pulp-current.

It will be understood that in practice either more or less than the number of magnetic riffles shown may be employed. It will also be understood that the arrangement of the trough in a rectangular form, as shown in Fig. 1, is not essential; but this form has the advantage, beside practically occupying a relatively small amount of shop-room in proportion to the length of the trough, of also providing for the abrupt change of the current at the corners of the trough. The pulp having passed over the several magnetic riffles passes along in the direction of the arrow c , and is delivered to the receiving-tank or paper-making machine through the outlet-pipe 12, or through some other convenient outlet.

Having thus described my invention, I claim—

1. In a pulp-separator, the combination, with a separator-trough, of the settling-box below and connected at the upper part thereof with said trough, the supply-pipe entering said box near the lower end thereof, and cross-bars arranged alternately on opposite sides of said box above the supply-pipe, one or more of said cross-bars being magnetic.

2. In a pulp-separator, the combination, with the separator-trough, of the magnet-case set on and crosswise of the bottom of the trough, and one or more magnets standing with their poles in said case, whereby the magnet-provided case constitutes a magnetic riffle.

3. In a pulp-separator, the combination, with the separator-trough, of a hollow magnet-case standing in and crosswise of the trough over an opening therein and extending entirely across the trough, and a magnet removably fixed in said case, whereby the magnet-provided case constitutes a magnetic riffle, and the magnet may be removed and replaced while the separator is in use.

4. In a pulp-separator, the combination, substantially as described, with the separator-trough having the receiving-chamber, of means delivering the pulp to said chamber at the lower part thereof, and successive magnetic riffles set at successive elevations, respectively.

5. In a pulp-separator, the combination,

with the separator-trough, of a series of rif-
fles, substantially as described, made shorter
than the width of the trough and set alter-
nately against opposite sides of the trough,
5 whereby the pulp-current is given a serpen-
tine direction.

6. In a pulp-separator, the combination,
with a trough in which one part is located
crosswise to a preceding part, of magnetic
10 riffles set crosswise to each other adjacent to
the junction of said parts, whereby the cur-
rent is abruptly changed and the pulp inter-
mingled against the riffle-surfaces.

7. In a pulp-separator, the combination,
with the hollow riffle, of magnets set in a 15
magnet-carrier, substantially as described,
and means locking said carrier to the sepa-
rator, with the magnets projecting from the
carrier into said riffle.

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Witnesses:

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