To all whom it may concern:

Be it known that I, FRITZ EUGEN NEUBERT, of Penig, Saxony, Post-Strasse No. 6, Germany, have invented certain new and useful Improvements in Apparatus for Making Containers of Paper and the like, of which the following is a specification.

This invention relates to an improved apparatus for making containers of paper and the like by precipitating a layer of pulp capable of being pressed onto a mold pervious to water and subsequently couching the fibrous layer in an outer casing surrounding the mold.

A novel feature of the apparatus consists in the arrangement of means for sucking the water out of the mold, after the termination of the time allowed for the precipitation, at the same time as the superfusible pulp-water, in order to prevent the layer of precipitated pulp from being injured by water subsequently entering into the interior of the mold, this being preferably effected by such dimensions of the pipes, valves and the like that the water-level in the mold falls more rapidly than the level of the pulp-water outside the mold, so that water passes more readily inward than outward.

The trough containing pulp-water is preferably prevented from being completely emptied by providing a connecting pipe which opens at the bottom of the permeable mold in the trough and admits air at the correct time into the suction pipe, thereby rendering the latter inoperative. Further, when there are several molds or sieves their connecting pipes and the suction pipe are preferably so laid that the pipes connecting the insides of the molds remain filled; the molds are thereby separated from one another and independent regulation of the successive operations in the individual molds is possible.

An important part of the improved apparatus is a box, into which the various pipes for supplying and leading away the pulp-water as well as those for the suction open, and at which are provided the requisite automatic and manually-operated valves for regulating the plant.

The press for pressing the paper mass preferably comprises an outer casing for taking up the pressure and a removable inner fitting, consisting of one or more pieces of sheet metal, which fit tightly in the casing, while when the fitting is pushed out the pieces, in case several of them are provided, are elastically spread apart, so that the paper body is released.

Other important features of the presses are, that the pieces are perforated by a great number of holes joined on the outer side of the fitting by slots spirally provided in the casing, in order to enable the water to flow away; further, the sheet metal pieces may be provided each with one or more annular ring sections fitted at the ends with taps and holes for centering the ring and sheet sections with reference to each other. Furthermore the fitting pieces may preferably be provided with any desired inscriptions and ornamentations for making impressions in the paper bodies to be made.

An important feature of the couching and pressing device is an arrangement by which the water is pressed out with a constantly increasing pressure in individual stages separated by periods of zero pressure; the water contained in the layer is thereby given time to be distributed during the periods free from pressure, and the formation of veins of water in the layer of paper leading to the perforations and joints of the fitting pieces is prevented. The device for automatically obtaining this change of pressure preferably comprises one or more valves which are loaded by weight-carriers having a variable load and thereby allow the excess pressure medium at any required pressure to escape. The weight-carriers are preferably formed as levers having sliding weights moved by cams, and the interruptions of pressure are preferably obtained by means of relieving bars which lift the sliding weights at predetermined places from their levers.

The invention consists in the operations and in the construction, arrangement and combination of parts described heretofore and pointed out in the claims.

The improved apparatus for making containers of paper and the like is diagram-
matically represented by way of example in the accompanying drawing, wherein:

Figure 1 is a longitudinal section showing the arrangement of the principal constituent parts of the apparatus.

Fig. 2 is a like section taken through the pipe box.

Fig. 3 is a like section taken through the closed couching mold.

Fig. 4 is a like section taken through the open mold.

Fig. 5 is a horizontal section taken through the opened fitting of the mold.

Fig. 6 is an elevation, partly in section, showing the pressure-changing device for the presses.

Fig. 7 is a horizontal section thereof, and Fig. 8 is a top view showing the upper part thereof.

Referring to the drawing, the pulp-water trough 1 contains the molds or sieves 2, on which the pulp suspended in the pulp-water is precipitated owing to the water being sucked through the sieves by a pipe 3. By opening the valve 5 the trough can be emptied through the discharge pipe 4 after the pulp-water has been sucked away through the suction pipe 3 to level with the tops of the molds, this pipe 3 being then closed.

For working the pipes correctly a box 6 (Figs. 1 and 2) is provided, into which the pipe 4 opens. A pulp pipe 7 leading to the trough 1 opens into this box, and also a pipe 8 which leads to the chambers in the molds and is connected therewith by branches 9; the end of this pipe 8 in the box 6 is normally closed by a check valve 10 which carries a float 11 for counter-balancing part of its weight. The cover 6a of the box carries a double-acting valve 12, 13, the disk 12 being seated by atmospheric pressure and the disk 13 by the pressure in the box 6, the valve being partially balanced by a float 14. A pipe 15 also opens into the box 6 and connects it with the trough 1 at the level of the bottom edge of the molds; this pipe is also provided with a check valve, so that the contents of the box cannot flow to the pulp-water trough 1.

The apparatus described so far operates as follows:

After a layer of pulp has been precipitated on the molds 2 by means of the pipe 5, the box 6 is filled with pulp-water and the discharge pipe 4 exercises a suction action under the action of gravity; the superfluous pulp-water consequently flows out of the trough 1 through the pipe 7 to the box 6. The check valve 10 of the pipe 8 is simultaneously opened by the suction action, and the water inside the molds is also sucked away and, when the sections of the pipes are equal, the water-level sinks more quickly in the molds than outside the same in the trough 1, because there is less water in the molds than outside the same. As soon as the level of the pulp-water has reached the lower edge of the molds the mouth of the pipe 15 in the trough 1 is opened, air enters into the box 6, the column of water in the discharge pipe 4 breaks and the suction action ceases.

The position of the pipe 8 is such that when the suction action ceases, the branch 75 pipes 9 which lead from the pipe 8 to inside the molds remain partly filled, so that the chambers in the various molds 2 remain separated from one another and can be dealt with further individually.

The precipitated layers of pulp are coughed by the molds 2 in the casings 17 suspended on a traveling crane 16; after a mold 2 has been covered by a casing 17 a pressure medium, e. g., compressed air, is supplied directly by a pipe 80 (Fig. 6) into the mold, or a rubber bag in the mold is expanded, whereby the water is pressed out of the loose layer of paper pulp covering the mold, a varying pressure being applied several times as described heretofore; the precipitated layers are then lifted together with the casings 17, from the molds 2. The valve 5 is then closed and the valve 18 of the pulp-supply pipe 19 is opened, so that the paper pulp enters into the box 6 through the top part of the pipe 4 and by lifting the valve 12, 13 enters into the box 20 mounted on the box 6. The float 14 is hereby lifted and the valve 12, 13 with it, so that its lower disk 13 is seated against the cover of the box 6. The pulp-water flows through the pipes 19 and 4 to the box 6 and the trough 1 and fills the latter, whereupon the valve 18 is closed. The described cycle of operations then begins again.

The couching mold shown in Figs. 3 to 5 comprises a casing 17 suspended from a traveling crane 16 and a fitting 21. The fitting 21 comprises four sheet metal pieces 110 attached at their upper ends to four central members 22 which are slidably mounted at a common plate 23 with which they can be removed from the casing 17 by means of a toothed rack or a spindle 28, to which 115 the common plate 23 is fixed. The central members 22 and the common plate 23 are conical at their outer surfaces and are surrounded by a support 24 having a conical bore at its under side which support 24 130 in a bore of its upper part takes up the spindle 28 and a surrounding spiral spring 29 adapted to raise the spindle with the fitting by pressing against an upper piston 233 fixed at the spindle 29. The slideable 125 connection between the central members 22 and the common plate 23 is effected by bolts 25 of the latter engaging with radial T-shaped slots 26 at the upper side of the central members 22. Two crosswise ra-
dially arranged spiral springs 27 serve to press the central members 22 and the ad-
joined fittings 21 outward to contact in every moment with the casings 24 and 17
respectively for freeing the paper container after being completed, by lowering the
parts 21 to 27.

The support or casing 24 is mounted at
the platform 28 of the traveling crane 16 by
10 hooks 25* linked at a traverse 29§ which is
mounted on the said platform 28 and which
has a central hole for allowing a pressing
spindle (not shown) of the crane to freely
pass and exert a pressure on the piston 25*
of the spindle 29§ in order to free the per-
fectly pressed paper container of the fit-
tings 21 after all processes have been com-
pleted. The hooks 25* allow to take the fit-
ting 21 wholly out of the mantle casing or
20 mold 17 if another fitting is to be used, as
later mentioned.

At the under edge of the fittings 21 and at
their outer faces are attached annular ring
sections 21§ having each a tap 21§ at one
e end and a hole at the other end for center-
ing themselves against each other during
their radial movements.

The fittings 21 are pierced by perforations
29 joined with each other by small grooves
30§ drawn in an oblique direction in the
outer face of the fittings 21, and in the
inner face of the mold casing 17 are cut
vertical grooves 29§ which in combination
with the perforations 29 and the small
35 grooves 29§ allow the water pressed out of
the adjacent layer of pulp to flow away.

The fittings 21 are preferably made of
sheet steel or aluminum or a similar ma-
terial, and they can be readily provided on
their inner faces with ornamentations and
inscriptions, such as are to be impressed in
the paper vessel; also, strengthened edges
or ribs of the paper container can be pro-
duced in this manner.

A mold with a sole rigid fitting can be
used for making small thin-walled articles.
In this case after the paper layer has been
pressed the fittings 21 and the paper bodies
are taken out of the mantles 17 as above
mentioned and dried in a drying chamber,
the paper bodies thereby become free and
fall out of the molds 21.

The device for producing the change of
pressure during the pressing operations is
shown in Figs. 7 to 9. It comprises an over-
flow box 31 into which the pipe 30 for sup-
plying the pressure medium for couching
opens by way of ports 30§. Each of these
ports is controlled by an overflow valve 32
having a spindle 33 passing through the
35 top 34 of the box 31 and loaded above by
a lever 35. These levers are fulcrumed in
brackets on the top 34 of the box and each
carries a carriage 36 which may contain
any desired number of weights. These car-
riages are shifted on the levers 35 by rock-
ing levers 37 which are moved by means of
links 38 and levers 39 carrying rollers 40.

The movement is brought about by the roll-
ers 40 which run on cams 41, the latter be-
ing so driven through the medium of gear-
ning 42, 43, 44, 45 driven by a countershaft
46 having a fast and loose pulley that the
cams 41 rotate one revolution during the
time required for one couching operation.

The levers 39 having the antifriction roll-
ers 40 are pressed against the cams 41 by a
weight 47 whose rope 48 is attached to one
of the rocking levers 37.

The shape of the cams 41 is that of a 80
spiral, so that the carriages 36 are gradu-
ally pushed along the levers 35, whereby
the valves 32 are gradually loaded more
and more and the pressure is increased. The
peripheries of the cams 41 may be provided
with recesses which cause a temporary low-
ering of the pressure; in the present case
auxiliary rails 49 are arranged beside the
levers 35, the same being attached by means
of brackets 50 in the top 34 of the box. 90

These auxiliary rails 49 have projections
51, on to which the rollers 52 of the car-
rriages 36 run, and when the carriages pass
over these places the levers 35 are relieved,
so that the valves 32 are released and the
95 pressure medium can flow out freely. The
sequence of pressures may thus be as fol-
lows, for example:

\[0-5-20-50-200-0 \text{ kg. per sq. cm.}\]

Several valves 32 are arranged instead
of only one in order to render the jamming
of a valve less injurious and to improve the
capability of regulation.

The cams 41, auxiliary rails 49 and the 105
load carried by the carriages 36 are ex-
changeable, so that the apparatus can be
readily adapted to all the working condi-
tions as regards the thickness and other fea-
tures of the layer of paper to be couched. 110

I claim:
1. In an improved apparatus for making
containers of paper and the like by pre-
cipitating a layer of pulp onto a mold the
combination with a trough for pulp water
115 and a plurality of hollow molds pervious
to water therein, of a sucking device, a pipe
connecting the said sucking device with the
interior of the molds, a second pipe con-
necting the trough with the same sucking
device or with another simultaneously act-
ing sucking device, and means for couching
layers of pulp precipitated on the molds.

2. In an improved apparatus for making
containers of paper and the like by pre-
cipitating a layer of pulp onto a mold the
combination with a trough for pulp water
125 and a plurality of hollow molds pervious
to water therein, of a sucking device, a pipe
connecting the said sucking device with the
interior of the molds, a second pipe connect-
ing the trough with the same sucking device or with another simultaneously acting sucking device, means for couching layers of pulp precipitated on the molds, and such an arrangement of valves in the pipes or such dimensions of the pipes relatively to the dimensions of the trough and of the interior of the molds, that the level of water in the molds is caused to sink more rapidly than that of the pulp water.

3. In an improved apparatus for making containers of paper and the like by precipitating a layer of pulp onto a mold the combination with a trough for pulp water and plurality of hollow molds pervious to water therein, of a sucking device, a pipe connecting the said sucking device with the interior of the molds, a second pipe connect-
ing the trough with the same sucking device or with another simultaneously acting sucking device, means for couching layers of pulp precipitated on the molds, and a pipe connecting the sucking pipe with the trough in the level of the bottom of the molds for automatically stopping the suction at this point.

4. In an improved apparatus for making containers of paper and the like by precipitating a layer of pulp onto a mold the combination with a trough for pulp water and a plurality of hollow molds pervious to water therein, of a sucking device, a pipe connecting the said sucking device with the interior of the molds, a second pipe connect-
ing the trough with the same sucking device or with another simultaneously acting sucking device, means for couching layers of pulp precipitated on the molds, and such an arrangement of valves in the pipes or such dimensions of the pipes relatively to the dimensions of the trough and of the interior of the molds, that the level of water in the molds is caused to sink more rapidly than that of the pulp water, and a pipe connecting the sucking pipe with the trough in the level of the bottom of the molds for automatically stopping the suction at this point.

5. In apparatus for making containers of pap-
er pulp and the like, the combination with a trough for pulp-water and a plurality of hollow molds pervious to water therein, of a closed box, a pulp-water pipe connecting the box with the trough, a discharge or suction pipe opening into the box, a pulp-water supply pipe opening into the box, a connecting pipe connecting the box with the interior of the molds, a check valve in the box controlling the one end of the connecting pipe, and a pipe having one end opening in the trough on a level with the bottom of the molds and its other end opening into the box, a check valve in the latter pipe, a double acting valve mounted in the top of the box, and means for couching lay-
ers of pulp precipitated on the molds.

6. In apparatus for making containers of paper pulp and the like, the combination with a trough for pulp-water and a plurality of hollow molds pervious to water therein, of a system of pipes comprising a closed box having a double acting valve in the top thereof for supplying pulp-water to the trough and for draining away super-
floos pulp-water from the trough and water from the interior of the molds, and means for pressing layers of pulp precipitated on the molds, said means comprising a strong outer casing for each mold, a perforated fitting normally in each casing, and means for supplying a medium under pressure to the interior of the molds carrying layers of pulp located in the fittings.

7. In apparatus for making containers of paper pulp and the like, the combination with a trough for pulp-water and a plurality of hollow molds pervious to water therein, of a system of pipes comprising a closed box having a double acting valve in the top thereof for supplying pulp-water to the trough and for draining away super-
floos pulp-water from the trough and water from the interior of the molds, and means for pressing layers of pulp precipitated on the molds, said means comprising a strong outer casing for each mold, a fitting normally in each casing and means for supplying a medium under pressure to the interior of the molds carrying layers of pulp located in the fittings, each fitting comprising a plurality of sheet pieces movably connected together.

8. In apparatus for making containers of paper pulp and the like, the combination with a trough for pulp-water and a plurality of hollow molds pervious to water therein, of a system of pipes comprising a closed box having a double acting valve in the top thereof for supplying pulp-water to the trough and for draining away super-
floos pulp-water from the trough and water from the interior of the molds, and means for pressing layers of pulp precipitated on the molds, said means comprising a strong outer casing for each mold, a fitting normally in each casing and means for supplying a medium under pressure to the interior of the molds carrying layers of pulp located in the fittings, each fitting being adapted to fit snugly into its casing and comprising a plurality of sheet pieces, a common plate guiding the sheet pieces in a radial direction, conical central portions of the sheet pieces, an outer conus surrounding the said conical portions and springs pressing the conical portions and sheet pieces outward to contact with the outer casings.
9. In apparatus for making containers of paper pulp and the like, the combination with a hollow mold pervious to water and means for forming a layer of pulp thereon, of means for pressing the layer of pulp on the mold, said latter means comprising an outer casing, a sectional lining in the casing, a head to which the lining sections are secured, means for moving the lining longitudinally in the casing, means when said lining is moved longitudinally to cause the sections to open, and means for supplying a medium under pressure to the interior of the mold.

10. In an apparatus for making paper containers, the combination of a trough, a plurality of stationary hollow molds mounted in the trough, means for precipitating a layer of pulp on the molds, means for sucking the liquid from the molds and trough, means for causing the liquid to be drawn from the molds more rapidly than that of the water from the pulp, and means cooperating with the molds for coughing the pulp on said molds.

11. In apparatus for making containers of paper pulp and the like, the combination with a hollow mold pervious to water, means for forming a layer of pulp thereon, and an outer casing for surrounding the mold carrying the layer of pulp, of means for supplying a medium under pressure to the interior of the mold, said means comprising a pressure medium supply pipe, a valve controlling the latter and a member adapted to carry a variable load pressing on the valve.

12. In apparatus for making containers of paper pulp and the like, the combination with a hollow mold pervious to water, means for forming a layer of pulp thereon, and an outer casing for surrounding the mold carrying the layer of pulp, of means for supplying a medium under pressure to the interior of the mold, said means comprising a pressure-medium supply pipe, a valve controlling the latter, a lever carried by the valve, a carriage for weights movable along the lever, and cam-operated means for shifting the carriage along the lever.

13. In apparatus for making containers of paper pulp and the like, the combination with a hollow mold pervious to water, means for forming a layer of pulp thereon, and an outer casing for surrounding the mold carrying the layer of pulp, of means for supplying a medium under pressure to the interior of the mold, said means comprising a pressure-medium supply pipe, a valve controlling the latter, a lever carried by the valve, a carriage for weights movable along the lever, an auxiliary rail adjacent to the lever, said rail having projections adapted to lift the carriage off the lever when passing over the same, and cam-operated means for shifting the carriage along the lever.

14. In an apparatus for making paper containers, the combination of a trough, a plurality of stationary hollow molds mounted in the trough, means for precipitating a layer of pulp on the molds, means for sucking the liquid from the molds and trough, a track above the trough, a carriage operable on the track, a plurality of compressing members carried by the carriage and cooperating with the molds, and means for supplying a medium under pressure to the interior of the molds.

15. In an apparatus for making paper containers, the combination of a trough, a plurality of stationary hollow molds mounted in the trough, means for precipitating a layer of pulp on the molds, means for sucking the liquid from the molds and trough, a track above the trough, a carriage operable on the track, a plurality of compressing members carried by the carriage and cooperating with the molds, and means for supplying a medium under pressure to the interior of the molds.

16. In an apparatus for making paper containers, the combination of a trough, a plurality of stationary hollow molds mounted in the trough, means for precipitating a layer of pulp on the molds, means for sucking the liquid from the molds and trough, a track above the trough, a plurality of compressing members movably supported above the trough and cooperating with the molds, each compressing member comprising a casing, a section lining movably mounted in the casing, a head to which the lining sections are secured, means for operating the head to move the lining within the casing to open the sections thereof, and means for supplying a medium under pressure to the interior of the molds.

17. In an apparatus for making paper containers, the combination of a trough, a plurality of stationary hollow molds mounted in the trough, means for precipitating a layer of pulp on the molds, means for removing the liquid from the trough and hollow molds, said means including means for causing the level of the water to fall more rapidly in the molds than in the trough, a plurality of compressing members mounted above the trough and cooperating with the molds, and means for supplying a medium under pressure to the interior of the molds during the molding operation.

18. In an apparatus for making paper containers, the combination of a trough, a plurality of stationary hollow molds mounted in the trough, means for precipitating a layer of pulp on the molds, suction means for sucking the water from the molds and trough.
including a tank and valves, a pipe communicat

5 ing with the trough at or about the

level of the bottom thereof and the tank for

automatically stopping the suction action,
a plurality of compressing members located
above the trough to cooperate with the
molds, and means for supplying a medium
under pressure to the interior of the molds
during the molding operation.

19. In an apparatus for making paper
containers, the combination of a trough, a
plurality of stationary hollow molds mounted
in the trough, means for precipitating a
layer of pulp on the molds, means for remov-
ing the water from the trough and molds, a
plurality of compressing members mounted
above the trough, each compressing member
comprising a casing, a sectional lining in the
casing, a conical head to which the sections
of the lining are secured, springs for nor-
mally pressing the lining sections against
the walls of the casing, and spring actuated
means for normally holding the lining
drawn up in the casing, and adapted when
operated to move the lining longitudinally in
the casing to spread the sections apart.

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

FRITZ EUGEN NEUBERT.

Witnesses:
LEO BERGHOFLZ,
BERTOLD A. BRAUN.