(No Model.)

# G. W. CLARK.

## TUBE MACHINE.

No. 456,615. Patented July 28, 1891.

Fig. 1.

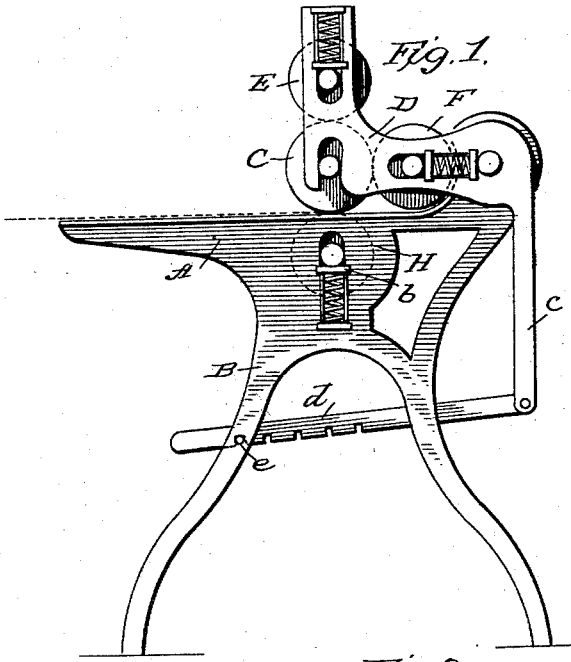


Fig. 2.

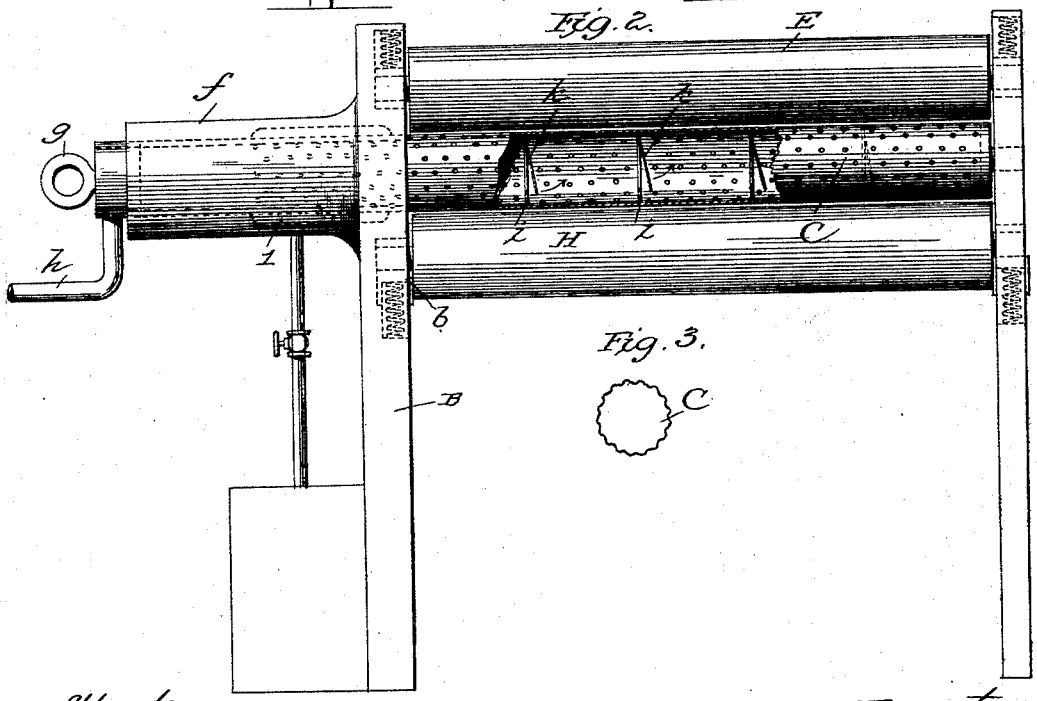


Fig. 3.




Attest:
Walter Dwaldson
W. P. Keene.

Inventor
George W. Clark
by Geo. L. Clark
Atty.

# UNITED STATES PATENT OFFICE.

GEORGE W. CLARK, OF SHADYSIDE, NEW JERSEY.

## TUBE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 456,615, dated July 28, 1891.

Application filed November 12, 1890. Serial No. 371,218. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. CLARK, a citizen of the United States of America, residing at Shadyside, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Tube-Machines, of which the following is a specification.

My invention relates to the formation of paper tubes, and while I had in mind particularly paper tubes adapted for use as rockets after being properly prepared, I do not limit myself in this particular, for the reason that the tubes may be used for a variety of purposes.

My invention has for its object the formation of the paper tubes cheaply and quickly and by such improved means as to permit of the ready handling of the tubes and their easy removal from the forming-mandrel after being formed.

My invention consists, first, in winding the paper of which the tube is to be formed on a perforated mandrel, securing the paper thus rolled in the form of a tube and separating it from the rest of the sheet or roll, expanding the tube and holding it by its periphery, and removing the mandrel while the tube is expanded.

It further consists in forming the tube on a perforated mandrel, expanding the tube by means of the pressure of compressed air, steam, or gas, holding it while so expanded by its periphery, and in withdrawing the mandrel while the tube is thus expanded.

It further consists of a mandrel having its periphery perforated, around which the paper is rolled to form a tube, said mandrel being hollow and in connection with a source of pressure—such as compressed air, gas, or steam—adapted to expand the paper-tube to permit the mandrel to be withdrawn, said mandrel being provided with a series of valves to control the pressure and prevent its waste in the withdrawal of the mandrel.

The invention further consists in the details of construction, hereinafter more fully described and particularly claimed.

In the drawings, Figure 1 is a side elevation of an apparatus of the type in which I will use my invention. Fig. 2 is a front view of the same. Fig. 3 is a sectional view taken transversely of the mandrel.

In the figures the table of the apparatus is shown at A, supported by a suitable framework B. Below the bed of the machine I journal a roller H in spring-bearings *b*, which exert a constant pressure upward. A bracket D has an extension which is located above the table-bed, directly over the roller H, and this extension supports a roller E, also supported in spring-bearings. The upper roller E is readily movable, as the bracket D is pivoted to the rear of the table and is provided with a downward extension *c*, which is connected to a holding-bar *d*, toothed, as shown, and adapted to engage a cross piece or pin *e* on the frame, and thus hold the bracket D in position. By the movement of the bar *d* the bracket may be moved on its pivot and the roller E moved away from or toward the mandrel C, which when in use is located directly between the rollers H and E. The bracket has the lower end of its extension bifurcated to inclose the journals of the mandrel, and at the same time permit vertical movement. Instead of this construction, however, the mandrel may have its bearings in the permanent side walls of the apparatus. In rear of the mandrel is a third roller F, likewise in spring-bearings, and with these rollers pressing against the mandrel at top, bottom, and rear the paper is evenly pressed and fed to the mandrel. After the paper is wound on the mandrel to form the tube the end is secured by paste or cement in any desirable or convenient manner, and it then becomes necessary to remove the tube from the mandrel.

The mandrel is perforated throughout its periphery, and in order to prevent the paper from adhering too closely to its surface I corrugate the face of the mandrel, leaving projecting ribs, which receive the inner periphery of the tube.

One of the standards of the machine, as shown in Fig. 2, is provided with an elongated bearing *f*, which receives the extension of the mandrel, which is of greater length than the feeding or pressure rolls. This elongated bearing is of greater diameter internally than the diameter of the mandrel, except at its extreme front and rear ends, so as to form bearings at

these points, and this leaves a space around the mandrel within the bearings, which space is in connection with a source of compressed air, (hot or cold,) gas, or steam, and this air, steam, or gas is controlled by means of suitable valves or cocks.

When it is desired to remove the finished tube from the mandrel, pressure is turned on and the air, steam, or gas passes to the interior of the mandrel from the space surrounding it in the long bearing, and from thence to the interior of the tube, and the pressure exerting its influence through the perforations will expand the tube sufficiently to allow the mandrel to be easily withdrawn through the long bearing by using the handle or pull *g*. The several spring-pressed rollers constitute a yielding holding means, which engages with and holds the tube by its periphery when expanded, besides serving to press the paper to the mandrel when the tube is being wound. The mandrel may be revolved in winding by the handle *h* or by a band and pulley, as desired.

In order to facilitate the withdrawal of the mandrel, it may be made slightly tapering, if desired, as indicated in dotted lines.

In order to save the pressure and prevent waste of the compressed air, gas, or steam in the withdrawal of the mandrel, I have provided the mandrel with a series of diaphragms *i*, dividing it into a series of compartments, and each diaphragm has a valve *k*, opening in the direction of the arrows, Fig. 2. This permits the pressure to pass to each compartment when the mandrel is in its normal position; but as it is withdrawn as soon as the first diaphragm passes the point *l* in Fig. 2, the pressure closes the valve and prevents waste or pressure where it is not needed.

I claim as my invention—

1. The herein-described method, consisting in winding paper upon a mandrel to form a roll, securing it as thus rolled in, then expanding the tube and holding it by its exterior while expanded, and removing the mandrel while the tube is expanded and so held, substantially as described.

2. The described method, consisting in winding paper upon a mandrel to form a roll, securing it as thus formed and applying the pressure of air, gas, or steam thereto to expand the same, and finally removing the mandrel while the tube is expanded and held by its exterior, substantially as described.

3. In combination with a tube-machine, yielding holding means for the exterior of the tube, and a perforated mandrel in connection with a source of pressure, said mandrel being removable, substantially as described.

4. In combination with a tube-machine, a perforated mandrel in connection with a source of pressure, said mandrel being of tapering shape and removable, substantially as described.

5. In combination with a tube-machine, a perforated mandrel having a corrugated periphery, substantially as described.

6. In combination, in a tube-machine, a standard having a bearing with an air space or chamber formed therein, a pipe connecting with said chamber from a source of pressure, and a perforated mandrel for receiving the tube, the perforations of which open into the air-space in the bearing, whereby the pressure reaches the interior of the mandrel and the interior of the tube, substantially as described.

7. In combination with an elongated bearing, a mandrel supported thereby, a source of pressure in connection with the mandrel, said mandrel having a perforated periphery, and a series of valves within the same, substantially as described.

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

GEO. W. CLARK.

Witnesses:

V. VAN DYCK,

JOHN B. BENTON.