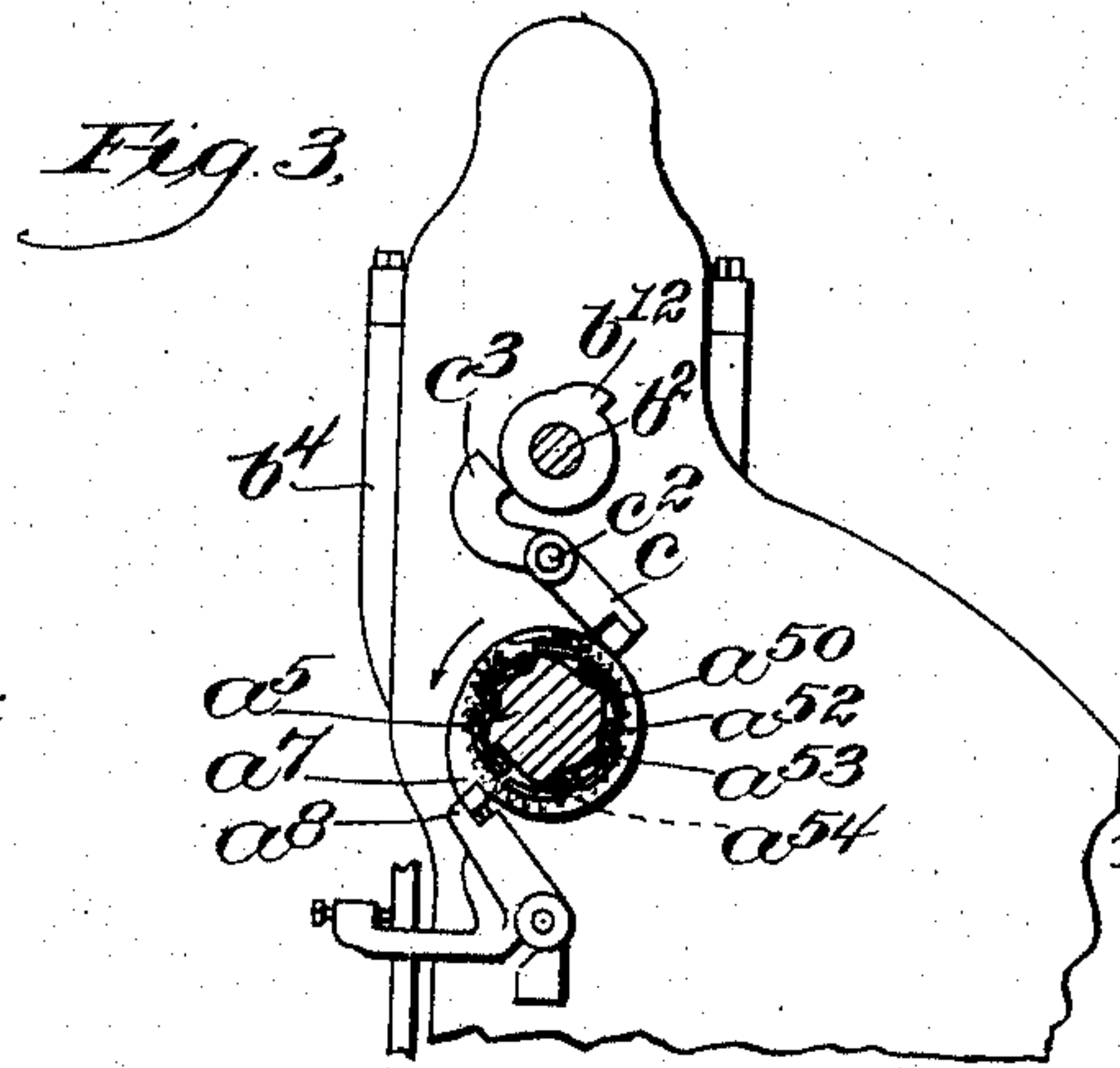
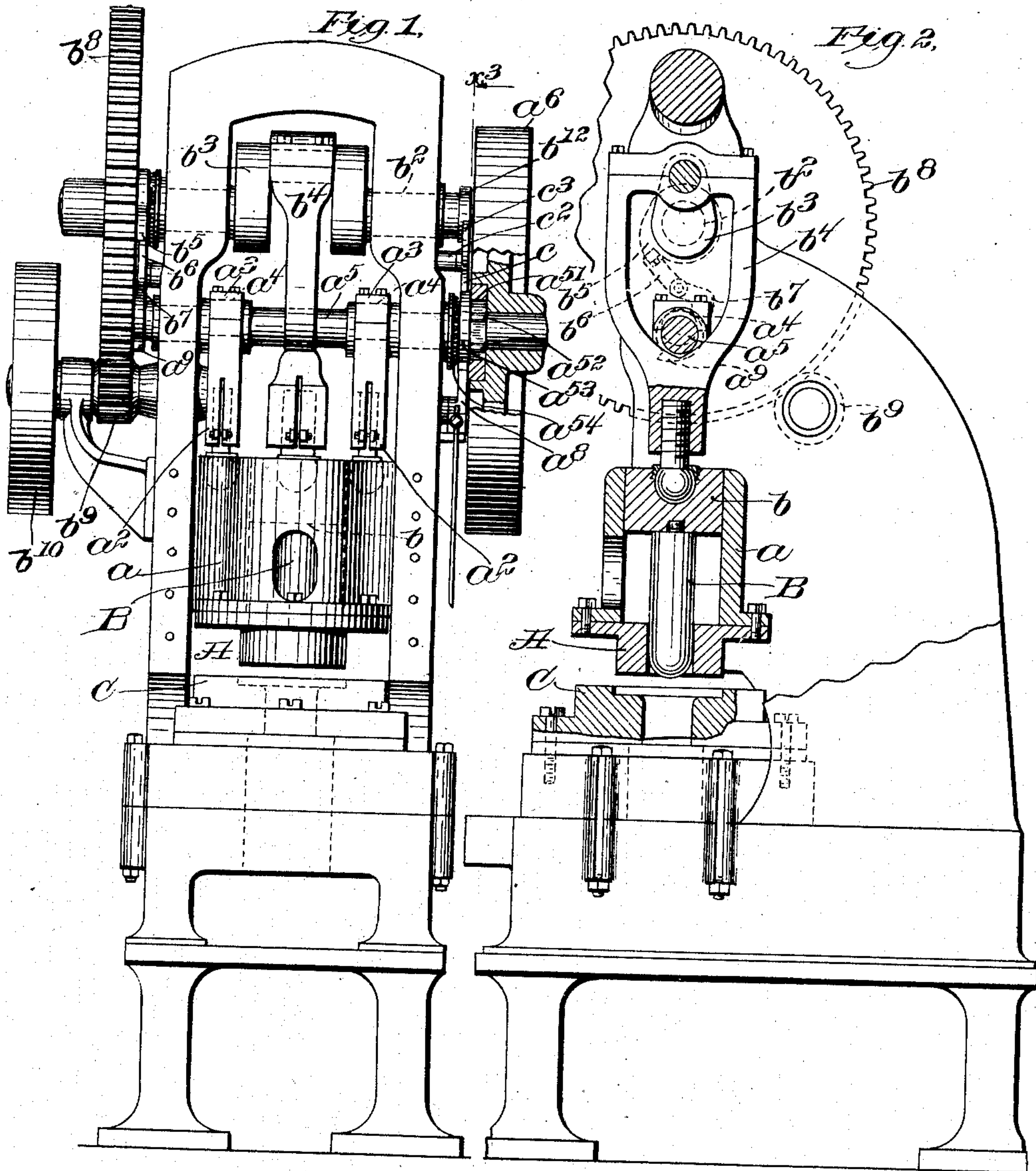


No. 864,417.

PATENTED AUG. 27, 1907.

A. FREIER.
COMBINED PUNCHING AND DRAWING MACHINE.
APPLICATION FILED JUNE 14, 1906.



Witnesses:
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UNITED STATES PATENT OFFICE.

ANTON FREIER, OF BOSTON, MASSACHUSETTS.

COMBINED PUNCHING AND DRAWING MACHINE.

No. 864,417.

Specification of Letters Patent.

Patented Aug. 27, 1907.

Application filed June 14, 1906. Serial No. 321,684.

To all whom it may concern:

Be it known that I, ANTON FREIER, a citizen of the United States, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Combined Punching and Drawing Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention relates to a machine for punching and drawing sheet metal and is embodied in a machine in which separate shafts are employed to operate the punch and the drawing tool, it being practicable, therefore, to utilize the machine for a punching process or for a drawing process only, if desired, the construction furthermore, being much simpler and requiring less weight than that of the combined machines which have heretofore been used.

In carrying out a punching and drawing process, the punch has a relatively short movement, while the drawing tool requires a relatively long movement, it being not only practicable, but desirable, to cause the punch to dwell after the material has been cut out so as to constitute a holder for the edge of the cut piece to prevent the said cut piece from crimping during the operation of the drawing tool.

In accordance with the invention, the machine is provided with a shaft having a driving connection with a punch, of such a nature as to produce a short but powerful movement of the said punch, an eccentric being a desirable form of mechanical connection. This shaft is operated from a driving pulley through the agency of an automatic clutch, such as a ball clutch, in which the driven member is released from the driving member when acted upon by a suitable stop, and connected with the driving member automatically when the said stop is removed. The drawing tool is operated from another shaft, and is preferably geared so as to have a relatively long and slow movement, the mechanical connection between this shaft and the drawing tool being preferably a crank and pitman connection. This shaft is also operated through the agency of an automatic clutch. The two shafts are so related to each other that, upon removing the stop controlled by the operator, the punch carrying shaft will operate through a half a revolution, at the end of which the controlling stop comes in contact with an intermediate stop, thereby releasing the clutch and stopping the rotation of the said shaft. This same shaft, however, carries a cam projection which is arranged to trip a stop cooperating with the clutch on the other shaft so as to start the rotation thereof in order to operate the drawing tool.

The shaft which operates the drawing tool is in turn provided at the opposite end with a cam projection which cooperates with the stop for the punch carrying shaft, so that at the end of the drawing operation, the

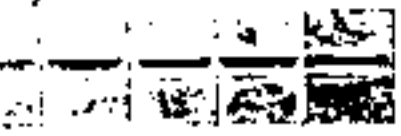
punch carrying shaft is set in operation, making half a revolution at the end of which time it comes in contact with the original manually operated stop to stop the machine entirely.

Figure 1 is a front elevation of a machine embodying the invention; Fig. 2 is a transverse section partly in elevation of the same; and Fig. 3 is a detail in section on line x^3 of Fig. 1.

The punch carrier a is connected by means of two pitmen a^2 which are provided with eccentric straps a^3 , with the eccentrics a^4 on a shaft a^5 , so that during half a rotation of said shaft, a slow but powerful downward movement of the punch is produced to punch out the blank from the sheet. The shaft a^5 is driven by any suitable driving member such as the pulley a^6 , the movement of which is under the control of an automatic clutch of any suitable or usual type.

For purposes of illustration, the clutch is shown as embodied in a ratchet surface a^{50} formed on the shaft a^5 , the pulley being loose on the shaft and provided with an annular surface a^{51} to cooperate with rollers a^{52} interposed between the ratchet surface a^{50} and said annular portion a^{51} . The rollers are arranged to be acted upon by means of a cage a^{53} having a spring connection with the shaft a^5 . The said cage a^{53} is provided with a lateral projection or shoulder a^7 , which is arranged to be initially engaged by a stop a^8 which is under the control of the operator. Upon the removal of the stop, therefore, the spring acts upon the cage to jam the rollers between the ratchet surfaces of the shaft, and the cylindrical surface of the pulley, so that upon removal of the stop a^8 from the shoulder a^7 the rotation of the shaft a^5 is started. This is one of the usual types of automatic clutches, so that further detailed description is not deemed necessary. In order, however, to hold the material in place at the end of the punching operation, the machine is provided with means for causing the punch to dwell during the operation of drawing the material, the latter operation being produced by means of a suitable drawing tool B mounted on the carrier b . This carrier b is operated by a separate and independent actuating shaft b^2 to which it is connected by means of a crank b^3 and pitman b^4 , the crank being of sufficient length to provide for a relatively long movement of the carrier b to produce the necessary drawing operation.

It is to be understood that the punch A carried by the punch carrier a is provided with an opening in the middle through which the drawing tool passes to engage the blank, the edge of which is held in position by the punch cooperating with the die C. The arrangement is such that the shaft b^2 is caused to rotate through the agency of the shaft a^5 , the said shaft a^5 being arrested after having made a half a revolution, at the same time starting the shaft b^2 , which, in turn, operates at the end of half a revolution, that is to say, after the drawing process has been completed, to release the shaft a^5

which then completes its rotation, restoring the punch A to its original position. The shaft b^2 is controlled by a clutch similar to that which controls the shaft a^5 , the cage member of said clutch being provided with a shoulder b^5 which coöperates with a stop b^6 which normally stands in the position shown in Fig. 2, so as to prevent the rotation of the shaft b^2 by its engagement with the shoulder b^5 . To coöperate with the stop b^6 , the shaft a^5 is provided with a cam a^9 which is herein shown as located at the opposite end of the shaft from the shoulder a^7 . This cam is so located as to engage a tail or projection b^7 connected with the stop b^6 , at the end of half a rotation of the shaft a^5 . At the time, therefore, that the punch has completed its operative movement, the stop b^6 is tripped so as to start the rotation of the shaft b^2 which then continues during a complete rotation, the punch shaft a^5 remaining stationary during the first half of the rotation of the drawing tool shaft, that is to say, until the drawing operation has been completed.] 

As herein shown, the shaft b^2 is driven through a gear b^8 from a gear b^9 on a stub shaft having a pulley b^{10} , the relation of the gears being such that the movement of the drawing tool will be relatively slow, as is necessary for the drawing operation. In order to stop at the end of the punching operation, that is to say, after one half a rotation of the shaft a^5 , the machine is provided with a supplemental stop c which is pivoted at a point adjacent to the shaft a^5 so as normally to lie in the path of the shoulder a^7 , as best indicated in Fig. 3. As will be seen from the said figure, the shoulder a^7 will come in contact with the end of the stop c after a half a rotation of the shaft a^5 , thereby releasing the clutch and stopping the further movement of said shaft. The stop c , however, is shown as pivotally supported at c^2 , and provided with a tail or projection c^3 which lies in the path of a cam b^{12} which is mounted on the shaft b^2 , the said cam being so located that, at the end of half a rotation of the shaft b^2 , it will come in contact with the tail c^3 so as to carry the stop c out of the path of the shoulder a^7 . This starts the rotation of the shaft a^5 , and both shafts then continue to rotate restoring both the punch and the drawing tool until the shaft a^5 is rearrested by the stop a^8 , and the shaft b^2 is arrested by the stop b^6 which drops back to its normal position as soon as it has been released by the cam a^9 .

It will be seen from the foregoing description that if the machine is to be used for drawing only, the punch-carrying member can be used for a holder, while, if the machine is to be used for punching alone, the shaft which operates the drawing member may be dis-

connected from the belt, so that the drawing tool will not operate at all. In this case, of course, the stop c can be rocked on its pivot and held in its abnormal position so as not to coöperate with the shoulder a^7 , thus allowing the punch shaft to make a complete and continuous rotation each time the machine is operated.

What I claim is:

1. The combination with a punch; of an actuating shaft therefor; a driving member for said shaft; a clutch to connect said actuating shaft and said driving member; a drawing tool; an actuating shaft therefor; a driving member for said drawing tool actuating shaft independent of the punch driving member; a clutch to control the operative connection between the drawing tool actuating shaft and drawing tool driving member; means operated by the punch driving member for operating the said clutch for the drawing tool driving member; and means operated by the drawing tool driving member for operating the clutch for the punch driving member.

2. A machine for drawing and punching comprising a punch member; a shaft for operating said member; a drawing member; an independent shaft for operating said drawing member; independent power devices for said shafts respectively and connecting mechanism whereby the operation of one of said shafts is controlled by the other, substantially as described.

3. A combined punching and drawing machine comprising a punch member; a shaft having an eccentric connection with said punch member; means for stopping said shaft at the end of half a rotation; a drawing tool concentric with the punch; an independent shaft having a crank and pitman connection with said drawing tool; means connected with the drawing tool shaft to cause a continuation of the rotation of the punching tool shaft at the end of half a rotation of the drawing tool shaft; means for stopping the rotation of both shafts at the end of a complete rotation of each; and independent driving mechanism for each shaft.

4. The combination with the punch and die; of a rotating shaft for moving said punch into contact with said die to punch the material; means for stopping the movement of the punch when the material has been punched and is held by the punch on the die; a drawing tool; a second rotating shaft for reciprocating said drawing tool through the punch to act on the material held by the punch on the die; and means operated by said second rotating shaft for starting said first rotating shaft to cause the return movement of the punch.

5. The combination with the punch and die; of the drawing tool working through the punch on the material cut out thereby; independent shafts for said punch and drawing tool; independently driven continuously operating pulleys for said shafts; clutches coöperating respectively with said pulleys and shafts; and means operated by each shaft for actuating the clutch belonging to the other shaft.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

ANTON FREIER.

Witnesses:

M. E. COVENEY,
H. J. LIVERMORE.