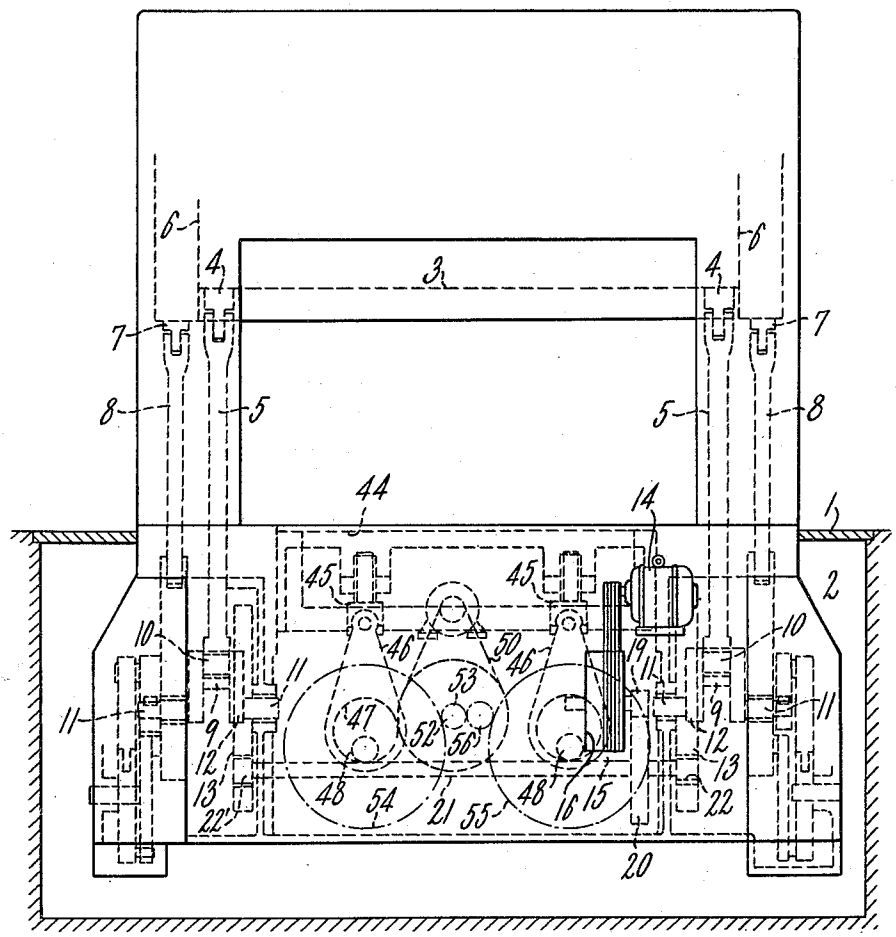
Oct. 23, 1956 J. OTT 2,767,674

SHEET METAL DRAWING PRESS

Filed Jan. 30, 1951 3 Sheets-Sheet 1

Fig. 1



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Oct. 23, 1956 J. OTT 2,767,674

SHEET METAL DRAWING PRESS

Filed Jan. 30, 1951. 3 Sheets-Sheet 2

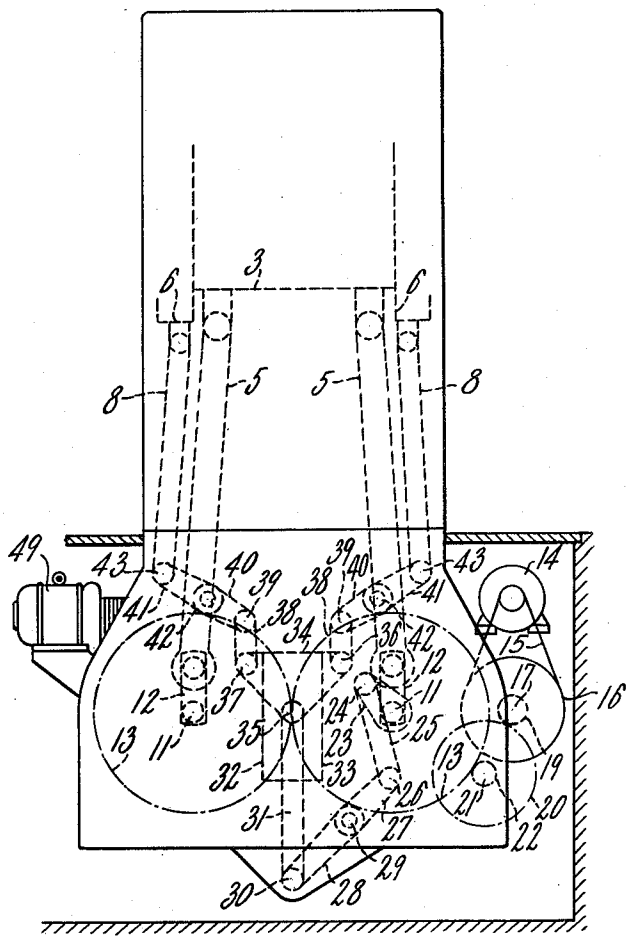


FIG. 2

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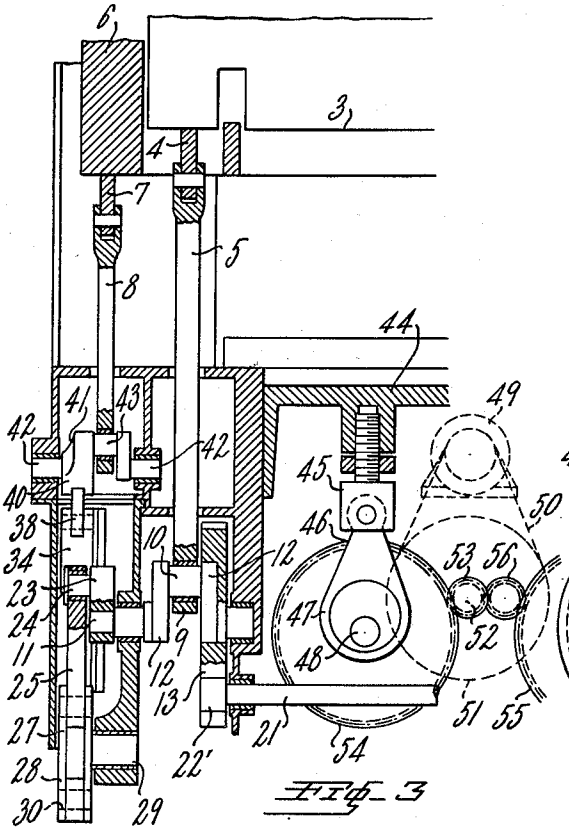


Fig. 3

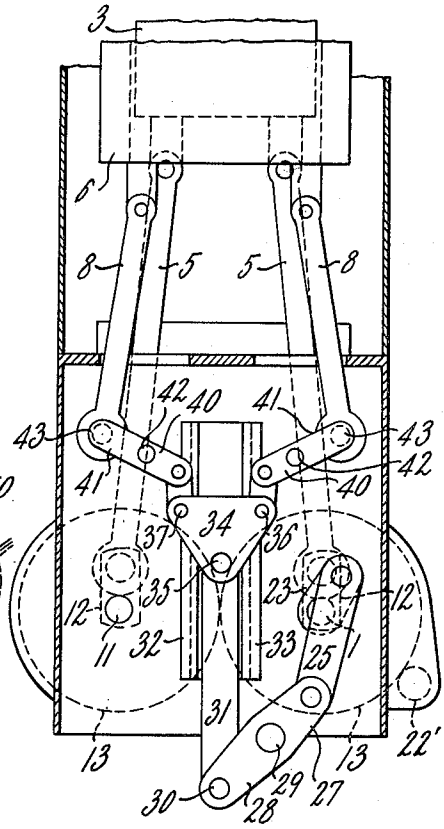


Fig. 4

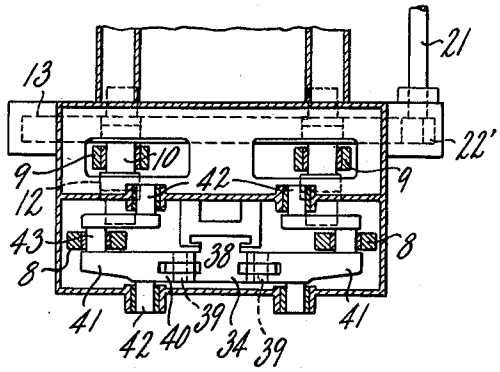


Fig. 5

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SHEET METAL DRAWING PRESS

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Application January 30, 1951, Serial No. 208,504

1 Claim. (Cl. 113—38)

This invention relates to a sheet metal drawing press and consists in the combination of the following features:

The press has a bottom drive, preferably underfloor drive; the bottom drive shafts having an elevated punch and an associated sheet metal holder extending longitudinally of the press, but only over approximately a quarter of the length thereof, the middle space being left free. The bottom drive shafts are longitudinally coupled with each other at both ends of the press by external driving means, preferably by an externally arranged off-centered connecting shaft. In the middle of the lower part of the press there is disposed an auxiliary press with an upwardly operating punch which can be actuated in dependence on the upper punch and sheet metal holder by electrical or mechanical means.

The construction according to this invention is simpler than in the previously known presses of comparable capacity. It provides the advantages of a bottom drive in multi-operation presses, and provides a four-point suspension of the upper drawing and sheet metal holding punch, as well as a counteracting punch arranged in the table.

A further feature of the invention consists in that the longitudinal bottom drive shafts are driven at the ends of the press by toothed gears from a common electric motor through a belt drive near one end of the press, the drive from this end to the operating mechanism at the other end being effected through an external connecting shaft. The external connecting shaft leaves the middle space in the lower part of the press frame free yet allows a rigid coupling of the driving means arranged at the two ends of the press frame.

In the preferred embodiment the upper punch and the associated metal holder are driven by connecting rods, of which the rod for driving the punch is jointed directly to crank arms, preferably sunk in the surface of driving gears, which are jointed to longitudinal shafts arranged at the ends of the press, while the connecting rods for the sheet metal holder are driven by other crank arms displaced relative to the first-mentioned crank arms, through lever mechanism, preferably in such a manner that from a first lever mechanism a linearly guided cross head is driven which actuates levers to the arms of which the connecting rod drive in the holder are jointed. This mechanism makes it possible to eliminate fastenings, for example, by means of keys, of lever arms or shafts, which are apt to become loose after long operation.

The invention finally consists in the arrangement of an auxiliary press in the lower part of the press frame, to actuate an upwardly operating punch, which press has a transverse shaft bottom drive, preferably from a separate motor, from which driving means with the reverse rotation actuate the punch so that the latter can be drawn downwardly and thrust upwardly. In this manner two high duty presses with independent drives arranged in easily inspected manner are combined into a unitary operable assembly.

The drawing shows by way of example a preferred embodiment of the invention, in which:

Figure 1 is a front elevational view.

Figure 2 is a corresponding end elevation of a press embodying the invention.

Fig. 3 is an enlarged fragmentary and sectional view of one part of the left hand portion of the press seen in Fig. 1.

Fig. 4 is an end view partly in section of the press seen in Fig. 3.

Fig. 5 is a top plan view partly in horizontal section through the press as seen in Fig. 4.

The drive members of the press are arranged in a foundation pit 2 below the floor 1 sustaining the press frame or a table, on foundation pedestals, not shown. The elevated punch 3 is driven by connecting rods 5 and intermediate elements 4, said rods 5 being connected to the punch at its four corners. The associated holder 6 for the sheet metal to be worked is similarly driven at its four corners by connecting rods 8 through intermediary elements 7. The heads 9, preferably divided, of the connecting rods 5 are journalled on crank pins 10 of crankshafts 11, four in number, which are journalled in the press frame near its ends and extend over about only one quarter of the length of the press. The crank arms 12 of the shaft 11 are sunk into the faces of drive gears 13 on this same shaft whereby a compact arrangement is obtained.

Near one end of the press frame, the right hand end in the example shown in Fig. 1, is the driving electric motor 14 driving through a wedge belt drive 15, a pulley 16 on the shaft 17 of which is mounted a pinion 19 engaging a spur wheel 20 of larger diameter. The spur wheel 20 is fixed on a main drive shaft 21, arranged away from the center as seen in Fig. 2. On the right hand end of the shaft is a pinion 22 driving the gear 13. There are two such gears 13 (Fig. 2), at each end of the press frame, in engagement one with the other and they drive the crankshafts 11.

Displaced relatively to the crank arm 12, the righthand crank shaft 11 (Fig. 2) carries another crank arm 23 operating the connecting rods 8 for the sheet metal holder. A link 25 is jointed at 24 to the crank arm 23 the other end of which link is jointed at 26 to one arm 27 of a rock lever 27, 28 pivoted at 29. To the arm 28 of this lever is jointed a thrust rod 31 jointed at 35 to a crosshead 34 guided in linear guides 32, 33. The crosshead 34 which has the form of an equilateral triangle standing on an apex, is jointed at its two upper axes 36, 37 to short links 38 connected at 39 to arms 40 of symmetrically arranged levers 40, 41 pivotable on pins 42. The ends of the other arms 41 of these levers are jointed at 43 to the connecting rods 8. A similar arrangement is provided at the other end of the press frame, the parts of which arrangement being driven through the intermediate shaft 21 and the pinion 22 on the left hand end of this shaft, as seen in Fig. 1.

The middle space of the press, left free by the arrangement hereinbefore described, is occupied by an auxiliary press with transverse shaft bottom drive, said auxiliary press having a punch 44, driven by connecting rods 46 through intermediate elements 45 permitting vertical adjustment. The connecting rods are vertically reciprocated by eccentrics 47 on eccentric shafts 48, driven from a separate electric motor 49 through a wedge belt drive 50 actuating a pulley 51 on the shaft 52 of which is fixed a pinion 53. The latter engages the left hand drive gear 54 (Fig. 1) integral with the eccentric 47. The drive gear 55 corresponding to the gear 54, at the right hand eccentric 47 (Fig. 1) is driven from the pinion 52 through an idler pinion 56 the sole function of which is to ob-

tain similar direction of rotation of the drive gears **55** and **54**.

The press according to this invention can be used without the auxiliary press built into the lower part of the press frame. Modified constructions are obtainable by replacing the described auxiliary press with auxiliary presses of other type. Also the punch **44** of the auxiliary press could be driven by crankshafts instead of by eccentrics.

Various changes and modifications may be made without departing from the spirit and scope of the present invention and it is intended that such obvious changes and modifications be embraced by the annexed claim.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

A sheet metal drawing press having a frame substantially rectangular in cross section with the short sides constituting the ends of the press comprising an upper punch, a sheet metal holder, a drive mechanism for said punch and said sheet metal holder mounted in the lower portion of the press frame, said drive mechanism further comprising outer and inner drive means for the sheet metal holder and punch, respectively, said inner drive means including two sets of crank shafts located at each end of said rectangular frame and extending with their axes in the longitudinal direction of the press frame to the extent of about one quarter of the length of the press frame, whereby an intermediate free central space of about one half the length of the press is attained, actuating transmission means for said punch and said sheet metal holder and including a main drive shaft located in a plane outside and laterally of said central space and extending longitudinally of the press frame and between two complementary crank shafts of each said set at opposite ends of said frame, a pair of pinions one mounted on each end of said main shaft, drive gears having recessed face portions and located at each end of the press frame and in respective driving relation with each other through said respective pinions, said crank shafts having on one side thereof crank arms sunk into said recessed face portions of said drive gears, an electric motor, means operatively connecting said motor with said main shaft to thereby move said crank shafts, two sets of outer and inner connecting rods, said upper punch being reciprocably movable through said inner connecting rods which are directly pivoted to said crank shafts respectively, said outer drive means for the sheet metal holder being connected to said outer connecting rods via a drive linkage comprising vertically reciprocable cross heads, a second set of crank shafts adjacent said first mentioned sets of crank shafts and connected to said drive shaft, one crank shaft of each of said second set being connected to said cross heads to drive the same, rocking levers pivoted intermediate their length to the ends of the press frame, one end of each of said rocking levers being pivotally connected to the respective outer connecting rod of said metal sheet holder, and link means connecting the other end of each rocking lever to the respective cross head, said cross heads, rocking levers, outer connecting rods and link means constituting two separate units each being disposed for movement in a plane normal to its respective crank shaft.

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