(No Model.) 4 Sheets—Sheet 1.

H. BESSON.

APPARATUS FOR DRILLING BROOMS OR BRUSHES.

No. 487,362. Patented Dec. 6, 1892.

Fig. 1.

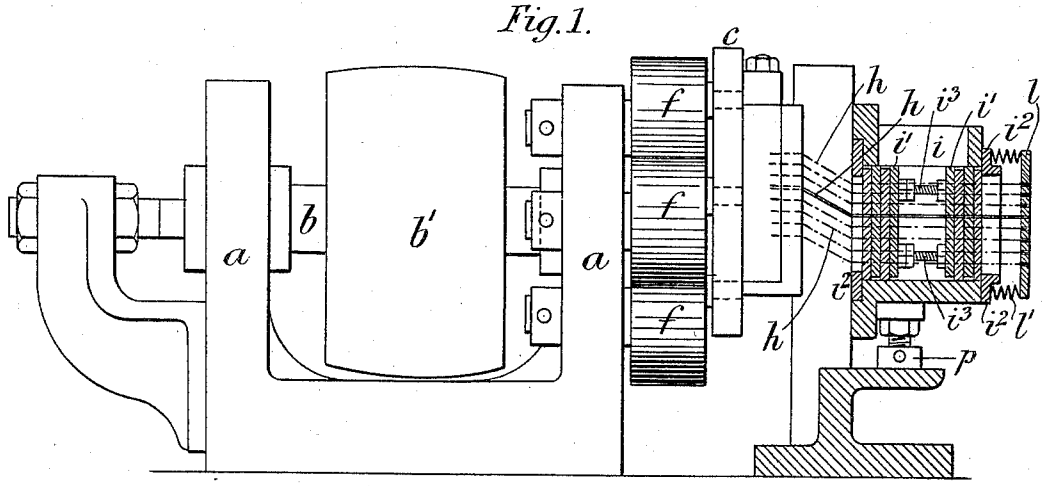


Fig. 2.

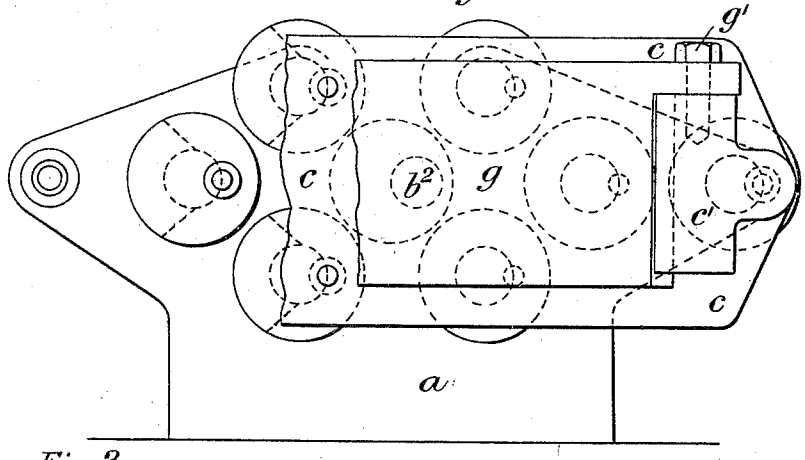


Fig. 3.

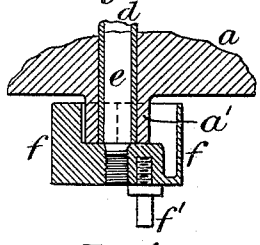


Fig. 4.

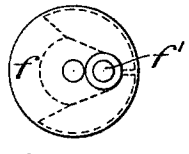


Fig. 5.

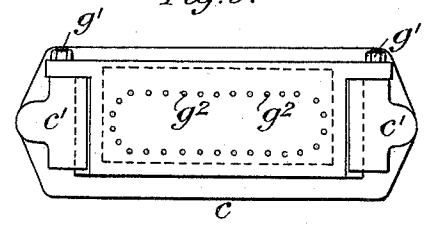


Fig. 6.

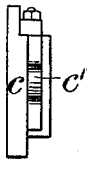
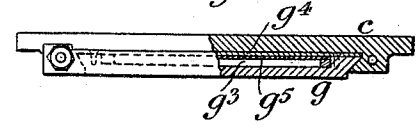


Fig. 7.



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(No Model.) 4 Sheets—Sheet 2.

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Fig. 8.

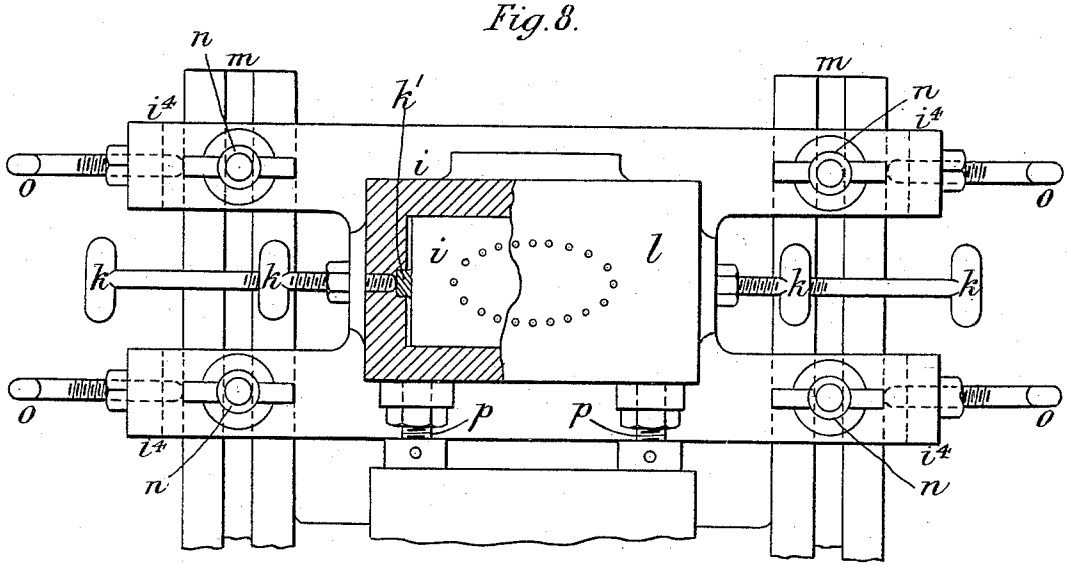

Fig. 9.

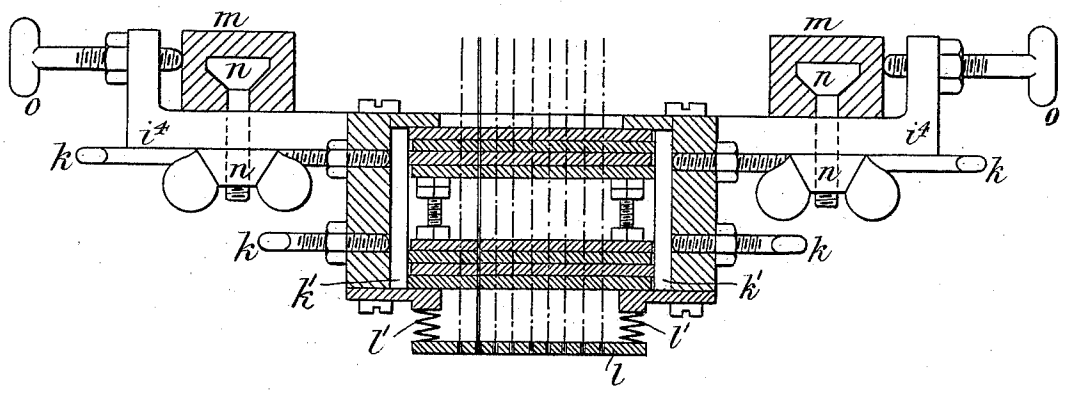

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Fig. 10.

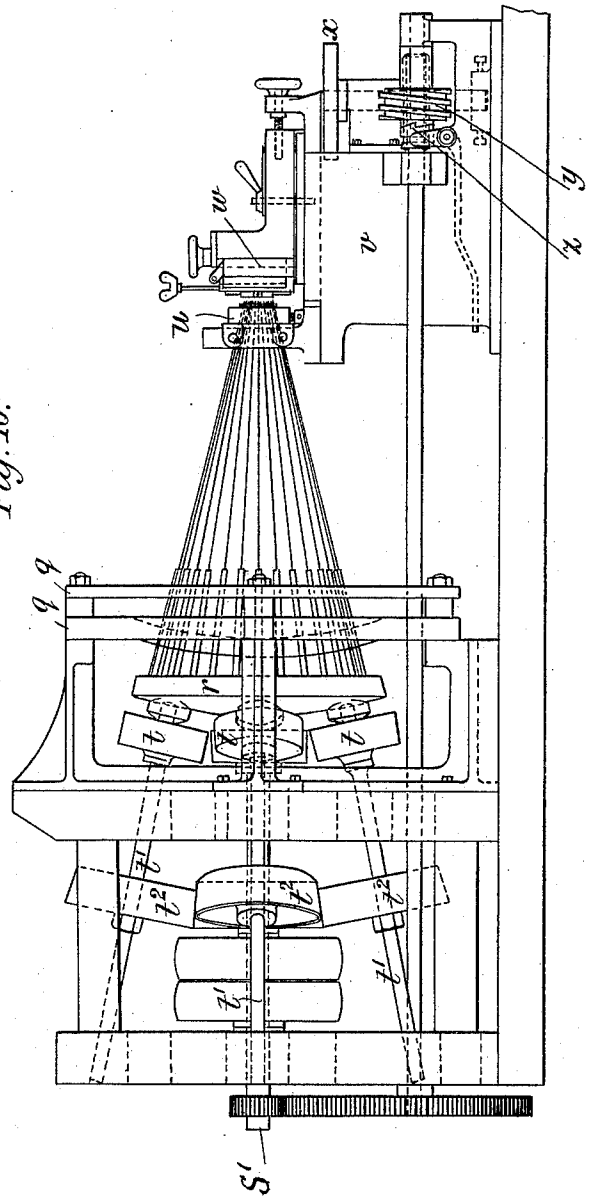

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Fig. 11.

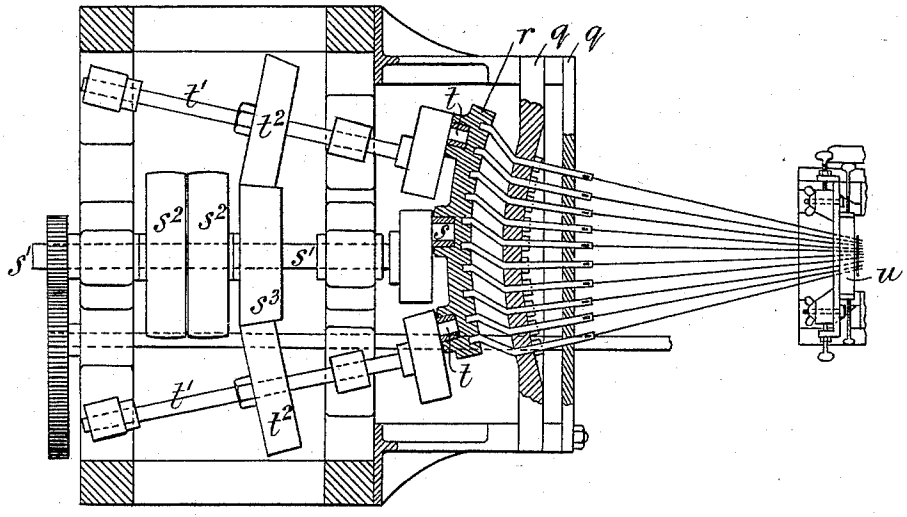
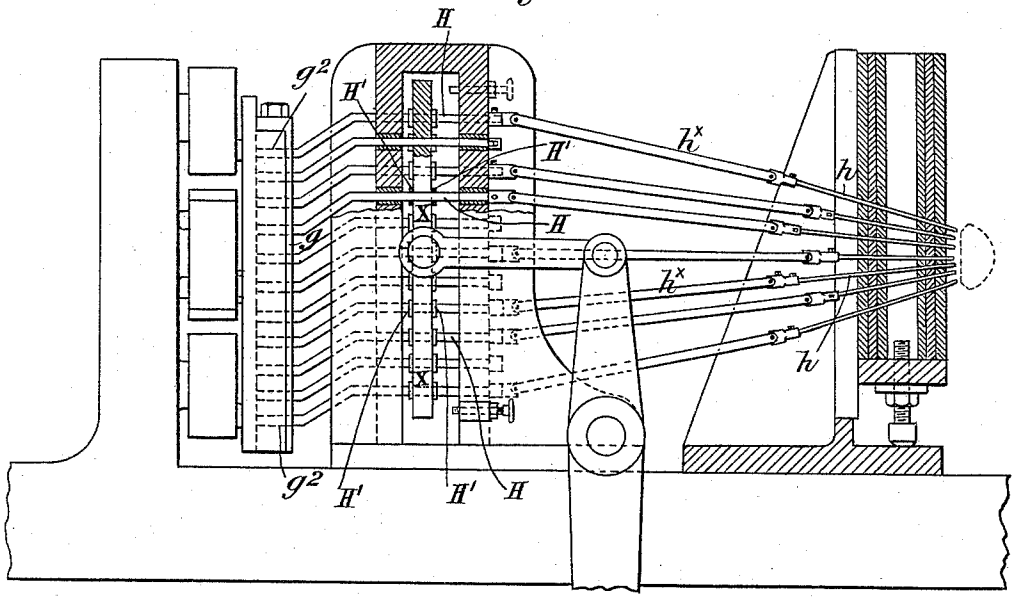


Fig. 12.



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UNITED STATES PATENT OFFICE.

HYPPOLITE BESSON, OF LONDON, ENGLAND, ASSIGNOR OF ONE-HALF TO GEORGE HAROLD KENT, ARTHUR BARTON KENT, AND ERNEST WEILD KENT, OF SAME PLACE.

APPARATUS FOR DRILLING BROOMS OR BRUSHES.

SPECIFICATION forming part of Letters Patent No. 487,362, dated December 6, 1892.

Application filed June 13, 1892. Serial No. 436,511. (No model.) Patented in England December 22, 1890, No. 20,897, and in France September 28, 1891, No. 216,389.

To all whom it may concern:

Be it known that I, HYPPOLITE BESSON, mechanical engineer, a subject of the Queen of Great Britain, residing at 46 Bonner Road, Bethnal Green, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Apparatus for Drilling Brooms or Brushes, (for which I have received Letters Patent in Great Britain, No. 20,897, dated December 22, 1890, and in France, No. 216,389, dated September 28, 1891,) of which the following is a specification.

This apparatus is of the class in which a number of drills having equal cranks at their ends are carried in bearings in a plate, the crank-pins working in bearings in another plate, every point of which is caused to move in a circle, so that all the drills are rotated simultaneously. According to this invention this second plate is driven by a single crank and is prevented from turning about the crank-pin by being so guided that at any time all points in it move parallel to each other. I guide the plate by means of a number of cranks equal in throw to the driving-crank, but which are not driven. These cranks carry counterbalance-weights to balance their weight and the weight of the moving plate. By this means a very steady motion, even at high speeds, is obtained. In cases where the drills, in place of being parallel to each other, are all directed radially toward a common point each plate is a portion of a sphere having this point as its center. The crank-pins of the drills also radiate to the same point. For producing holes which are inclined to each other, but do not radiate to a single center, similar arrangements may be adopted, motion being given by a moving plate to a number of cranks whose shafts work in bearings in a fixed plate, as above described; but in this case the motion must be conveyed from the shafts to the drills through universal joints or flexible shafts. Difficulty is experienced in accurately boring the long small holes in the fixed plate which form the bearings for the drills. In order to obviate this difficulty, I build up the fixed plate with a number of thin parallel plates, it being more easy to bore the holes truly in a thin than in a thick plate, and even if some of the holes in some of the plates are slightly inaccurate this error is corrected by the other plates, the plates being capable of adjustment relatively to each other by set-screws or other means.

In order that my said invention may be fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

Figure 1 is a side elevation, partly in section, of the drill-head of a multiple-drilling apparatus made in accordance with my invention. Fig. 2 is a front elevation of a portion of the same. Figs. 3 and 4 show details of one of the counterbalanced guiding-cranks. Figs. 5, 6, and 7 show the driving-plate to a smaller scale. Fig. 8 is a front elevation, partly in section, of the compound bearing or pattern-journal in which the drills are carried. The parts on which this bearing is mounted are also shown. Fig. 9 is a horizontal section on the line X X, Fig. 8. Fig. 10 is an elevation, and Fig. 11 is a plan, partly in section, of a drill-head for boring radial holes. Fig. 12 is an elevation, partly in section, of a drill-head for drilling holes, which are inclined to each other but are not radial.

I will in the first place describe the mechanism shown by Figs. 1 to 9. *a* is a head-stock. It is clamped fast upon a bed similar to a lathe-bed. The head-stock carries a shaft *b*, which is rapidly rotated by a belt passing around the pulley *b'*. At the end of the shaft *b* there is a disk having fixed to it a crank-pin b^2, and the plate *c*, which forms a part of the driving-plate, is mounted upon the crank-pin, the said pin being received into a bushed hole in the plate *c*. Upon the front face of the head-stock *a* there are bosses *a'*. They are bored to receive bushings *d d*, and in the bushings are spindles *e e*, which can revolve freely. The spindles *e* carry the guiding-cranks for controlling the driving-plate. Each guiding-crank consists of a cylindrical part *f*, fixed upon the spindle, and a light crank-pin *f'*, fixed into the part *f*. The holes in the plate *c* to receive the crank-pins *f'* are

suitably bushed. The cylindrical part f of each controlling-crank has hollows within it to lighten it on the side which receives the crank-pin f'; but the part is thick and solid on the other side to counterpoise the weight of the driving-plate and drill-cranks, so that there may be no preponderance of the moving parts in any direction. The plate c has jaws c' upon it, and between these jaws another plate g, also forming part of the driving-plate, is held. The plate g is slid down into its place between the inclined surfaces of the jaws and is secured by bolts g' g'. The face of the plate g is perforated with holes g^2 g^2, which accord in arrangement with the holes to be bored in the brush-back. When a change is to be made in the pattern of the work, the plate g is replaced by another plate in which the arrangement of the holes is suitable. The pattern-journal is changed simultaneously.

h h are the drills. Their stems are bent to form cranks corresponding in throw to the cranks which actuate and control the driving-plate. The rear ends of the drill-stems are inserted into the holes g^2. The plate g has a cavity g^3 within it, which is intended to contain grease, and there is a movable back or lid g^4, which serves to close the cavity in rear.

g^5 is a thin plate of hardened steel within the cavity g^3, and on this plate the stems of the drills abut. The pattern-journal consists of a box i, in which is a series of plates i'. These plates are bored with holes for the passage of the drills, and the plates are kept in place by front and back cover-frames i^2 i^2 and by pressure-screws i^3 i^3, which press the plates together. For the more accurate adjustment of the plates i' screws k k are provided in the ends of the box i. These screws act upon strips k' k' within the box and press them forward, causing them to bear upon alternate plates. The interior of the box i may, when the machine is at work, be charged with grease.

l is a perforated plate, supported at the front of the box i by coiled springs l' l'. When the work is pressed up toward the drills, the plate l yields freely, and when the work is withdrawn the plate l comes forward again and clears the wood, dust, or débris formed in the boring operation away from the points of the drills.

The pattern-journal is mounted upon a saddle, which is clamped down to the bed of the machine, but which when necesary can be adjusted in its position to and from the headstock. m m are standards rising from this saddle. The box i is made with four lugs i^4 i^4, and T-headed bolts n n pass through elongated holes in these lugs. The heads of the bolts n are held in cavities prepared for them in the standards m.

o o are adjusting-screws for adjusting the position of the box i laterally, and p p are other screws by which it is supported at the right height. When it has been accurately set, the pattern-journal is clamped fast to the standards m m by tightening the nuts on the bolts n n.

In Figs. 10 and 11 the drills radiate from a central point, and instead of being cranked or bent in themselves they are fixed into cranked drill-stems, to which they are locked by means of set-screws. q q are plates in which are holes serving as bearings for these drill-stems. The driving-plate r has a face of spherical form, into which the cranked ends of the drill-stems are also inserted, and the plate receives a spherical movement—that is to say, every point in the face of the plate is made to move in a path lying on the surface of a sphere and about the common center. The path in each case is circular and corresponds with the throw of the cranked drill-stems. The driving-plate is actuated by the crank s on the shaft s'. There are also belt-pulleys s^2 s^2 on the shaft s'. The controlling-cranks t t also engage with the driving-plates, as the drawings show. The shafts t' t' of these cranks and the shaft s' are all set radially to the common center. In order to insure smooth running at high speeds, I provide cone-pulleys t^2 t^2, fastened on the shafts t'. They are arranged to be in light contact with another cone-pulley s^3, which is mounted so that it can revolve freely on the shaft s'.

u is the pattern-journal. It is similar in its construction to that already described.

The pattern-journal is mounted on a slide on the saddle v, which slide also carries the work-holder w, as seen in Fig. 10. This work-holder is provided with clamping-jaws and adjusting-screws, as before stated. A cam x advances the work-slide and holder toward the drills and withdraws it when the drills have penetrated sufficiently deep. The cam has on its shaft a worm-wheel, with which a worm y engages. The worm is loose upon a shaft geared, as shown, with the shaft s', and it can be made fast with the shaft by a clutch z when the work is ready.

In Fig. 12 it will be seen that the drill-cranks H are connected with the drills h by intermediate spindles $h^\times$, which are each jointed with a universal or "gimbal" joint at one end to the crank H and at the other with the head of the drill h. The stems of the drill-cranks H pass through a plate X, and they are provided with collars H′ H′ on either side of the plate. To cause the drills to penetrate the work, the plate X is drawn forward by the lever-handle L. The cranks H are thereby drawn partially out of the holes g^2 in the plate g; but the passages are sufficiently long to prevent the cranks escaping altogether.

What I claim is—

1. A drilling apparatus comprising a series of cranked or bent drills, a driving-plate into which the cranked ends of the drills are inserted, a single driving-crank for giving circular motion to the driving-plate, a series of freely-rotating guiding-cranks, and counterbalance-weights for the guiding-cranks for

compensating the weight of the driving-plate and crank-pins.

2. In drilling apparatus, the combination of a number of cranked or bent drills, a driving-plate provided with holes for receiving the cranked ends of the said drills, a fixed plate supporting the bearing of a single driven crank whose crank-pin enters a hole in the driven plate, and bosses on the fixed plate, bored to receive pins fixed to a number of freely-rotating guiding-cranks, each consisting of a disk carrying a crank-pin entering a hole in the driven plate, the said disks being recessed, the walls of the recesses surrounding the bosses on the fixed plate and being of unequal thickness, so as to form counterbalance-weights, balancing the weight of the driving-plate and crank-pins.

3. In drilling apparatus, the combination of a number of drills, means for simultaneously rotating the same, a compound bearing or pattern journal consisting of a box or holder containing a series of plates bored with holes for the passage of the drills, and means for moving the said plates laterally relatively the one to the other.

4. In drilling apparatus, the combination of a number of drills, means for simultaneously rotating the same, a compound bearing or pattern journal consisting of a box or holder containing a number of plates bored with holes for the passage of the drills, the edges of some of such plates being in contact with one side of the box and the edges of the remainder in contact with the opposite side, means for causing the said opposite sides to approach each other, and means for forcing the faces of the said plates into contact with each other.

5. A drilling apparatus comprising a series of radially-arranged cranked or bent drills, a driving-plate for simultaneously rotating the drills, said driving-plate where it receives the drills having a face of spherical form, and a driving-crank and guiding-rolls on radial shafts for giving a spherical movement to the driving-plate.

6. In drilling apparatus, the combination of a number of drills inclined the one to the other, a pattern-journal in which the drills are set, intermediate spindles, each having one end connected by a universal joint to the end of one of the drills and the other end connected, also, by a universal joint to the end of one of a number of crank-shafts, the ends of the said cranks being received into holes in a driving-plate, by which said shafts are simultaneously rotated, projections on the said shafts, a plate received between the said projections, and means for moving the said plate longitudinally.

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